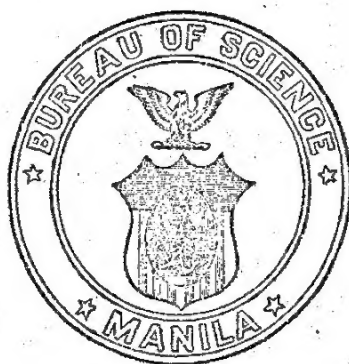


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ADDITIONS TO OUR KNOWLEDGE OF THE BORNEAN FLORA

By ELMER D. MERRILL

Director and Botanist, Bureau of Science, Manila

In the following contribution nineteen new species of Bornean plants are described, while seven previously described forms are recorded for the first time from Borneo. These notes and descriptions were written in 1918 and 1919, but in studying the extensive collections made by Maximo Ramos in British North Borneo in 1920 and in preparing for publication an extensive paper based largely on this collection,¹ the fact was overlooked that the following notes and descriptions had not been published. The only changes made are the addition of references to specimens collected since the original manuscript was completed.

In the paper submitted for publication in Singapore over one hundred new species are proposed and described, while fifty-eight previously described forms are credited to Borneo for the first time. These contributions, with others, bring the list of known Bornean species of flowering plants up to approximately 5,250; the number in my enumeration of Bornean plants,² the manuscript of which was completed in January, 1918, being 4,924.

¹ Merrill, E. D., New or noteworthy Bornean plants, Part 1, Journ. Str. Branch Roy. As. Soc. 85 (1922) 151-201 et seq.

² Merrill, E. D., A bibliographic enumeration of Bornean plants, Journ. Str. Branch Roy. As. Soc. Extra Number (1921) 1-637.

POTHOS Linnaeus

POTHOS MIRABILIS sp. nov. § *Allopothos*, *Longevaginati*.

Ramis 3 ad 4 mm diametro; foliis chartaceis vel subcoriaceis, oblongis, nitidis, leviter inaequilateralibus, usque ad 26 cm longis, tenuiter acuminatis, basi acutis, nervis collectivis marginalibus vel submarginalibus, lateralibus tenuibus, curvatis, numerosis, utrinque circiter 30; petiolis longe vaginantibus, 7 ad 9 cm longis; inflorescentiis solitariis, longe pedunculatis, spathis membranaceis, in siccitate brunneis, nitidis, valde reticulatis, tenuiter acuminatis, circiter 40 cm longis et 2 cm latis; spadicebus pedunculatis, circiter 10 cm longis et 5 mm diametro.

A scandent, apparently branched plant, the branches 3 to 4 mm in diameter. Leaves oblong, shining, pale greenish when dry, 20 to 26 cm long, 6 to 8 cm wide, slightly inequilateral, subequally narrowed to the acute base and the slenderly acuminate apex, chartaceous or subcoriaceous, the collective longitudinal nerves marginal or submarginal, one at the very edge of the leaf, the other about 2 mm from the margin, the lateral nerves numerous, slender, about 30 on each side of the midrib; petioles 7 to 9 cm long, sheathing, the upper 1 cm terete, the sheathing parts 1 cm wide or less (when spread). Inflorescences solitary, their peduncles slender, about 10 cm long. Spathes membranaceous, brown and shining when dry, translucent, linear-lanceolate, very long, about 40 cm long and 2 cm wide, slenderly acuminate, base decurrent along the peduncle, acute. Spadix cylindric, about 10 cm long and 5 mm in diameter, stipitate, the stipe about 2.5 cm long. Fruits cylindric, about 1 cm long, 1-seeded.

British North Borneo, Labuk and Sugut Districts, in the flat country of the Sumawang River valley, *Agama* 664, September 21, 1918, altitude about 20 meters; Batu Lima, *Ramos* 1260, October, 1920, *Elmer* 20364, November, 1920.

A most remarkable species on account of its greatly elongated spathes which are about 40 cm long and 2 cm wide, brown, shining, translucent when dry, and prominently reticulate. It is possible that this should be treated as the type of a new genus allied to *Pothos*, but for the present it seems best to refer it to *Pothos*, § *Allopothos*, *Longevaginati*. It is remote from all known species of the genus.

QUERCUS Linnaeus

QUERCUS BORNEENSIS sp. nov. § *Pasania*.

Arbor plus minusve ferrugineo-pubescentibus; foliis chartaceis, oblongis ad oblongo-lanceolatis vel oblongo-oblancheolatis,

usque ad 26 cm longis, basi acutis, apice tenuiter acuminatis, nervis utrinque 11 ad 13, subtus perspicuis; infructescentiis spicatis, fructibus sessilibus, cupulis obconicis, 1.7 cm longis, 1.5 ad 2 cm latis; glans cylindraceis, 2.8 ad 3.2 cm longis, 1.2 cm diametro.

A tree 10 to 15 m high, the branchlets, petioles, and leaves on the midrib and lateral nerves beneath softly ferruginous-pubescent. Leaves chartaceous, oblong to oblong-lanceolate or oblong-oblongeolate, entire, 15 to 26 cm long, 4 to 7 cm wide, pale when dry, shining, the base usually acute, apex slenderly acuminate; lateral nerves 11 to 13 on each side of the midrib, prominent on the lower surface, arched-anastomosing, the reticulations lax, distinct; petioles 7 to 10 mm long. Infructescences spicate, peduncled, 10 to 18 cm long, ferruginous-pubescent, the fruits somewhat crowded, sessile. Cups obconic, ferruginous-pubescent, truncate, about 1.7 cm long, 1.5 to 2 cm in diameter, the scales in numerous rows, their free tips 1 mm long or less. Glans brown, shining, glabrous, cylindric or sometimes slightly narrowed below, 2.8 to 3.2 cm long, about 1.2 cm in diameter.

British North Borneo, Tawao, *D. D. Wood* 450, 627 (type), June 5, 1917, and May 17, 1918. In forests at low altitudes.

In vegetative characters and in the shape of its cups this species strongly resembles *Quercus ochracea* (Schottky) Merr. The leaves, however, are thinner and much less pubescent, while the glans are entirely different in shape; in the latter species the glans are ellipsoid to obovoid and about as wide as long.

FICUS Linnaeus

FICUS INAEQUIPETIOLATA sp. nov. § *Eusyce*.

Frutex erectus, 1 ad 3 m altus; foliis alternis, chartaceis, oblongis, 10 ad 22 cm longis, basi plus minusve angustatis, obtusis vel rotundatis, 3-nervis, apice tenuiter acuminatis, margine distanter dentatis, utrinque scaberulis, costa utrinque ciliato-hispidis; nervis utrinque circiter 8, conspicuis; petiolo 1 ad 7 cm longo; receptaculis axillaribus, solitariis, sessilibus, globosis, scaberulis, 10 ad 12 mm diametro; pedicellis et perianthii segmentis perspicue longe ciliatis.

An erect shrub 1 to 3 m high, the branches rather slender, terete, rugose when dry, glabrous, usually reddish brown, the very young branchlets sparingly hispid with short, thick, stiff, scattered hairs. Leaves alternate, chartaceous, olivaceous to yellowish green when dry, shining, usually oblong, sometimes oblong-obovate, 10 to 22 cm long, 4 to 8.5 cm wide, somewhat narrowed below to the rounded or obtuse, distinctly 3-nerved

base, the apex rather slenderly acuminate, margins distantly and not very conspicuously dentate, the upper surface rather harsh from scattered, short, stiff, spreading hairs from thickened bases, the midrib on both surfaces rather densely ciliate-hispid, the lower surface with scattered, stiff, short hairs on the nerves and reticulations; lateral nerves above the basal pair about 8 on each side of the midrib, spreading, curved, arched-anastomosing near the margin, very prominent on the lower surface, the reticulations lax, prominent; petioles exceedingly variable in length, 1 to 7 cm long, more or less hispid; stipules lanceolate, acuminate, about 8 mm long, pubescent. Receptacles axillary, solitary, yellow when fresh, globose, sessile, 10 to 12 mm in diameter, hispid with short, stiff, scattered hairs, the basal bracts broadly ovate, acute, sparingly pubescent, about 2 mm long. Male flowers few and only near the ostiole, their pedicels about 1 mm long, conspicuously ciliate with long spreading hairs; segments 4, oblong-obovate to oblong, membranaceous, 1.5 mm long, glabrous or with very few hairs; stamens 2, the anthers about 0.8 mm long. Gall flowers very numerous, their pedicels slender up to 3 mm long, densely ciliate with long white hairs, 1.5 to 2 mm long; segments membranaceous, spatulate, prominently ciliate with long, white, 2 to 2.5 mm long hairs. Fertile female flowers in separate receptacles, similar to the gall flowers, their segments shorter; ovary inequilaterally obovoid, about 1.2 mm long, rather conspicuously rugose and distinctly keeled on the inflated side; styles glabrous, 1.5 mm long.

British North Borneo, Sandakan, *Castillo 602* (type), February 14, 1918, *Agama 485*, January, 1917, *Villamil 178*, March, 1916, *Ramos 1885*, November, 1920. In thickets on slopes at low altitudes.

This characteristic species is manifestly allied to *Ficus leucoptera* Miq., from which it is distinguished by many characters, notably its sessile receptacles; its scattered, stiff, short, hispid hairs, and the entire absence of soft appressed hairs; its dentate leaf margins; and its conspicuously long-ciliate pedicels and perianth segments.

OROPHEA Blume

OROPHEA MYRIANTHA sp. nov.

Arbor parva, leviter adpresse pubescentibus; foliis oblongis ad oblongo-ellipticis, chartaceis, 15 ad 22 cm longis, basi rotundatis ad obtusis, apice late acuminatis, nervis utrinque 8 ad 12, perspicuis; inflorescentiis axillaribus vel extra-axillaribus, multifloris, fasciculatis vel depauperato-cymosis, 4 ad 5 cm

diametro, confertis; sepalis ovatis, 3.5 mm longis, utrinque pubescentibus; petalis exterioribus elliptico-ovatis, utrinque angustatis, 6 mm longis, interioribus arcuatis, 7 mm longis; staminibus 12; carpellis 5, pubescentibus.

A tree about 10 m high, the branchlets, petioles, and midrib and nerves on the lower surface of the leaf sparingly appressed-pubescent, the inflorescences densely appressed-pubescent with gray hairs. Leaves oblong to oblong-elliptic, chartaceous, 15 to 22 cm long, 6.5 to 9 cm wide, base rounded to obtuse, apex broadly acuminate, the acumen blunt, sometimes apiculate; lateral nerves 8 to 12 on each side of the midrib, rather prominent beneath, ascending, anastomosing, the reticulations slender, not prominent; petioles about 5 mm long. Inflorescences axillary or extra-axillary, of many-flowered fascicles or sometimes of congested short cymes, the inflorescences 4 to 5 cm in diameter, with from 25 to 40 flowers. Flowers yellow, odorless, their pedicels 1.5 to 2 cm long, rather slender, the median bracteole oblong-ovate, acuminate, 4 mm long. Sepals ovate, 3.5 mm long, 3 mm wide, acute or slightly acuminate, pubescent on both surfaces. Outer petals elliptic-ovate, narrowed at both ends, pubescent, acute or slightly obtuse, 6 mm long, 5 mm wide; inner petals arched, about 7 mm long, the claw stout, glabrous, 3 mm long, the limb subrhomboid, 4 to 5 mm wide, pubescent on both surfaces above. Stamens about 12, about 1 mm long. Carpels usually 5, oblong, inequilateral, pubescent, 1.2 mm long.

British North Borneo, Tawao, *Agama* 544, May 11, 1918. In flat country along Brantion River, slightly above sea level, with the Malay name *banitan*.

The striking character by which this species may be distinguished is its very many-flowered inflorescences, some of which contain at least forty flowers; they are either in fascicles or in greatly congested, sometimes short-peduncled cymes.

LUNASIA Blanco

LUNASIA GIGANTIFOLIA sp. nov.

Frutex circiter 3 m altus, partibus junioribus lepidotis; foliis oblongis, chartaceis vel membranaceis, nitidis, usque ad 50 cm longis et 20 cm latis, integris, basi angustatis, cuneatis, apice perspicue acuminatis, nervis utrinque circiter 26, subtus valde conspicuis; inflorescentiis ♀ tenuibus, circiter 7 cm longis, subracemosis, paucifloris; floribus fasciculatis, vel in ramulis brevissimis dispositis; petalis oblongo-ovatis, obtusis, 2.5 mm longis.

A shrub about 3 m high, the branchlets, petioles, inflorescences, and the midrib and nerves at least in young leaves densely

lepidote with small scales. Branches somewhat triangular, the angles rounded. Leaves oblong, chartaceous or membranaceous, green when dry, shining, when young with scattered lepidote scales on both surfaces, the older ones becoming nearly glabrous, 38 to 50 cm long, 14 to 20 cm wide, entire, base narrowed, cuneate, apex rather prominently acuminate; lateral nerves about 26 on each side of the midrib, very prominent on the lower surface, the primary reticulations slender, distinct, subparallel; petioles 9 to 15 cm long. Pistillate inflorescences axillary, slender, about 7 cm long, subracemose, few-flowered, densely lepidote, the flowers fascicled or on very short branches, their pedicels 1 mm long or less. Sepals ovate, 1.5 mm long, acute, lepidote, petals 3, oblong-ovate, obtuse, 2.5 mm long, glabrous. Ovary very deeply 3-cleft, densely lepidote, lobes ovoid, inequilateral, about 1.2 mm long. Staminodes 3, shorter than the lobes of the ovary.

British North Borneo, Sandakan, *Agama* 582, August 22, 1918. On rocky ridges, altitude about 25 meters.

This species is well characterized by its very large leaves. It is manifestly allied to the Philippine *Lunasia macrophylla* Merr. from which it is easily distinguished by its membranaceous, much fewer-nerved leaves and much longer petioles.

CHISOCHETON Blume

CHISOCHETON POLYANDRUS sp. nov.

Arbor parva, ramis glabris vel subglabris; foliis usque ad 50 cm longis, foliolis plerumque 10, oppositis et alternis, oblongis, usque ad 27 cm longis, chartaceis, tenuiter acuminatis, basi leviter inaequalateralibus, angustatis, supra pallidis, glabris vel costa nervisque plus minusve puberulis vel pubescentibus, subtus subadpresse hirsutis, nervis utrinque circiter 15; inflorescentiis solitariis, in axillis superioribus, angustis, foliis subaequantibus, ut videtur pendulis, longe pedunculatis, partibus junioribus ferrugineo-pubescentibus; floribus subfasciculato-cymosis, rubris, numerosis, crassis, extus dense ferrugineo-pubescentibus, 3 ad 3.5 cm longis; petalis plerumque 6, inferne cum tubo stamineo coalitis; tubo stamineo extus glabro, intus patule hirsuto, apice laciniato, laciniis numerosis; antheris 12 ad 14.

A small tree, the branches dark reddish brown, glabrous or nearly so. Leaves up to 50 cm in length, the leaflets opposite and alternate, usually 10, oblong, chartaceous, 11 to 27 cm long, 5 to 7 cm wide, sometimes a few greatly reduced leaflets present below, slenderly acuminate, base narrowed, somewhat inequi-

lateral, the upper surface glabrous or the midrib and nerves somewhat puberulent, pale, shining, the lower surface appressed-hirsute with scattered hairs; lateral nerves distinct, about 15 on each side of the midrib; petiolules 2 mm long or less. Inflorescences narrow, in the upper axils, solitary, apparently pendulous, long-peduncled, about as long as the leaves, the younger parts ferruginous-pubescent. Flowers stout, 3 to 3.5 cm long, fasciculate-cymose, the depauperate cymes very short, scattered along the rachis. Calyx densely ferruginous-pubescent, truncate, cup-shaped, 5 to 8 mm long, 5 to 6 mm in diameter. Petals externally densely pubescent, coriaceous, subspatulate, usually 6, coalescing with the tube below. Staminal-tube glabrous externally, cylindric, the apex multifid, the laciniae linear, about 3 mm long, the tube inside glabrous in the lower and upper 5 mm, otherwise conspicuously hirsute with scattered, spreading hairs. Disk thick, truncate, 1 mm high, glabrous. Anthers 12 to 14, oblong, 4 mm long, appressed-hirsute with long scattered ferruginous hairs on the back. Style filiform, glabrous; stigma subcapitate, about 1 mm in diameter.

British North Borneo, Labuk, *D. D. Wood* 657, September 30, 1918. Near the banks of streams at low altitudes. Batu Lima, *Ramos* 1217. In damp forests at low altitudes. *Villamil* 226, in fruit, is probably referable here.

A species well characterized by its slender, elongated, very narrow inflorescences which are apparently pendulous; its stout, densely ferruginous-pubescent, mostly 6-merous flowers; and its numerous anthers. It does not appear to be closely allied to any previously described species but apparently belongs in the group with *Chisocheton penduliflorus* Hiern.

AGLAIA Loureiro

AGLAIA LUZONIENSIS (Vidal) Merr. & Rolfe in Philip. Journ. Sci. 3 (1908) Bot. 105.

Beddomea luzoniensis Vidal Rev. Pl. Vasc. Philip. (1886) 84.

Aglaiia monophylla Perk. Frag. Fl. Philip. (1904) 33.

Aglaiia unifoliolata Koord. in Meded. Lands Plantent. 19 (1908) 635.

British North Borneo, Suanlamba River, *Castillo* 655, August 19, 1918; Batu Lima, *Ramos* 1184, 1464, 1595. In forests at low altitudes.

Very common and widely distributed in the Philippines, extending to Celebes and New Guinea; new to Borneo.

APOROSA Blume

APOROSA GRANDISTIPULA sp. nov.

Arbor parva, glabra; foliis oblongis, integris, chartaceis ad subcoriaceis, 20 ad 30 cm longis, 9 ad 10 cm latis, nitidis, basi

rotundatis vel angustatis, semper auriculato-cordatis, apice abrupte acuminatis, nervis utrinque 17 ad 20, supra haud impressis, subtus valde perspicuis; petiolo 3 ad 4.5 cm longo; stipulis subcoriaceis, persistentibus, late acinaciformibus, usque ad 2.5 cm longis et 1.5 cm latis; infructescentiis lateralibus, pedunculatis, solitariis, 2.5 ad 3.5 cm longis, fructibus plerumque 2, longe pedicellatis, ovoideis, 1.5 ad 1.8 cm longis, 3-locellatis, pericarpio fragile, 1.5 mm crasso.

A glabrous tree about 6 m high. Leaves oblong, entire, firmly chartaceous to subcoriaceous, 20 to 30 cm long, 9 to 10 cm wide, grayish olivaceous when dry, shining, the base rounded, sometimes distinctly narrowed, always auriculate-cordate, the apex rather abruptly acuminate; lateral nerves 17 to 20 on each side of the midrib, not impressed on the upper surface, very prominent on the lower surface, somewhat curved, arched-anastomosing, the reticulations distinct; petioles 3 to 4.5 cm long; stipules very broadly acinaciform, persistent, the same color and consistency as the leaves, up to 2.5 cm long and 1.5 cm wide, one end very broadly rounded, the other falcate-acuminate. Infructescences lateral, solitary, peduncled, each usually bearing two fruits, the peduncles up to 3.5 cm long, the pedicels up to 1 cm long. Fruits ovoid, yellow, 1.5 to 1.8 cm long, 3-celled, the pericarp rather brittle, about 1.5 mm thick.

British North Borneo, Sandakan, *Agama* 579, August 22, 1918. In flat country of the Suanlamba River valley at low altitudes.

This species belongs in the group with *Aporosa benthamiana* Hook. f. and *A. lunata* Benth. and is more closely allied to the former, from which it is distinguished especially by its fewer-nerved leaves, much longer petioles, and entirely different infructescences.

CYCLOSTEMON Blume

CYCLOSTEMON CASTILLOI sp. nov.

Arbor parva, glabra; foliis chartaceis, integris, nitidis, oblongo-ovatis ad elliptico-ovatis, 10 ad 17 cm longis, apice tenuiter acuminatis, nervis utrinque circiter 5, perspicuis, reticulis laxis; fructibus globosis, circiter 2.5 cm diametro, 2-locellatis, in siccitate brunneis, pericarpio 5 mm crasso, fragile.

A glabrous tree (flowers not seen) about 10 m high, the branchlets slender, terete. Leaves chartaceous, entire, pale olivaceous, shining, of about the same color on both surfaces, oblong-ovate to elliptic-ovate, 10 to 17 cm long, 4 to 7.5 cm wide, the base acute to rounded, sometimes slightly inequilateral, the apex slenderly acuminate; lateral nerves about 5 on each side

of the midrib, rather prominent on the lower surface, curved, anastomosing, distant, the reticulations lax, distinct; petioles 5 to 8 mm long. Fruits yellowish brown when ripe, globose, glabrous, brown when dry, solitary, on the branchlets and older branches, about 2.5 cm in diameter, 2-celled, each cell with a single seed, the pericarp about 5 mm thick, rather brittle; pedicels up to 8 mm long.

British North Borneo, Sandakan, Suanlamba watershed, *Castillo 637*, August 26, 1918. In level country at low altitudes.

This species probably is as closely allied to *Cyclostemon palawensis* as to any other but is entirely glabrous and has larger, slenderly acuminate, fewer-nerved leaves, and apparently larger fruits although the mature fruits of the Palawan species are as yet unknown.

CYCLOSTEMON MEGACARPUS Merr. in Philip. Journ. Sci. 7 (1912) Bot. 387.

British North Borneo, Suanlamba River, *Agama 576*, August 20, 1918.

Philippines; this is the first extra-Philippine record for the species.

CROTON Linnaeus

CROTON CUMINGII Muell.-Arg. in Linnaea 34 (1865) 101, DC. Prodr. 15² (1886) 566.

British North Borneo, Tawao, *D. D. Wood 628*, May 22, 1918.

New to Borneo; upper Malay Peninsula, Riu Kiu Islands, Formosa, and the Philippines.

OMPHALEA Linnaeus

OMPHALEA SARGENTII Merr. in Philip. Journ. Sci. 16 (1920) 574.

British North Borneo, Suanlamba River, *Castillo 634*, August, 1918. Malay, *lasit*; Sebuga, *Ramos 1874*, December, 1920.

The specimen cited above is an excellent match for the type, a Philippine specimen, which was from an island between Palawan and Borneo. The second species of the genus from Borneo.

ZIZYPHUS Tournefort

ZIZYPHUS LENTICELLATA sp. nov.

Frutex scandens ramulis et subtus foliis ad nervis leviter adpresse-pubescentibus; ramis ramulisque lenticellatis; spinis recurvatis, solitariis, 5 mm longis; foliis firmiter chartaceis, oblongo-ellipticis, subolivaceis, nitidis, 6 ad 11 cm longis, utrinque angustatis, apice perspicue acuminatis, basi leviter inaequaliteralibus, minute cordatis, margine minute serrulatis; nervis 3,

supra impressis, subtus valde prominulis; infructescentiis axillaribus, 3 cm longis; fructibus ellipsoideis, glabris, lenticellatis, 2.5 cm longis.

A woody vine, the young branchlets and nerves on the lower surface of the leaves very sparingly appressed-pubescent. Branches and branchlets with rather numerous small lenticels, the stipular spines stout, recurved, about 5 mm long, usually only one subtending each leaf. Leaves firmly chartaceous to subcoriaceous, oblong-elliptic, subolivaceous, shining when dry, 6 to 11 cm long, 2.5 to 4.5 cm wide, narrowed at both ends, the apex prominently acuminate, the acumen blunt and usually apiculate, base slightly inequilateral, rather minutely cordate, prominently 3-nerved, the margins minutely serrulate; nerves impressed on the upper surface, the lateral pair extending into the acumen, very prominent on the lower surface, the transverse nervules and reticulations prominent; petioles 3 to 5 mm long, somewhat pubescent. Cymes axillary, more or less branched, in fruit about 3 cm long including the fruits, the latter ellipsoid, glabrous, prominently lenticellate, about 2.5 cm long.

British North Borneo, Sandakan, Suanlamba watershed, *Castillo 644*, August 9, 1918. On forested river banks, altitude about 50 meters. Batu Lima, *Agama 1018*, November, 1921.

This species in vegetative characters is very similar to *Zizyphus horsfieldii* Miq., but is especially distinguished by its ellipsoid, not globose, entirely glabrous, conspicuously lenticellate fruits.

STERCULIA Linnaeus

STERCULIA ACUMINATISSIMA sp. nov.

Arbor, inflorescentiis exceptis glabra; foliis chartaceis, oblongo-ovatis, utrinque nitidis, 16 ad 20 cm longis, basi late rotundatis, 3-nervis, apice tenuiter caudato-acuminatis, nervis utrinque circiter 5, perspicuis; inflorescentiis tenuibus, anguste paniculatis, circiter 20 cm longis, longe pedunculatis, castaneis, leviter pubescentibus; floribus 15 ad 18 mm longis, tenuiter pedicellatis, calycis tubo cylindraceo, subglabro, lobis 4 ad 6 mm longis, erectis, liberis, anguste oblongis, obtusis; ovario sessile, dense pubescente.

A tree, glabrous except the inflorescences, the ultimate branches grayish, 5 to 7 mm in diameter. Leaves chartaceous, oblong-ovate, shining on both surfaces, 16 to 20 cm long, 8 to 9 cm wide, the base rather broadly rounded, 3-nerved, the apex slenderly caudate-acuminate, the acumen about 2 cm long, acute;

lateral nerves above the basal pair, about 5 on each side of the midrib, distant, curved, anastomosing, the reticulations lax; petioles 6 cm long; stipules not seen. Inflorescences slender, narrowly paniculate, about 20 cm long, long-peduncled, castaneous when dry, pubescent, the lower branches up to 4 cm in length. Flowers 15 to 18 mm long, their pedicels 6 to 10 mm long. Calyx tube somewhat cylindric, nearly glabrous, the lobes 4 to 6 mm long, erect, ultimately spreading, narrowly oblong, obtuse, not at all cohering even in bud, hirsute inside. Ovary ovoid, subsessile, densely pubescent; style stout, pubescent, about 1 mm long, the stigmas somewhat spreading or recurved, thickly club-shaped, about 1 mm long, the carpels 3 or 4, nearly free. Anthers 10, sessile at the base of the carpels.

Sarawak, 1383 native collector.

This species belongs in the group with *Sterculia laevis* Wall., from which it is distinguished by its caudate-acuminate leaves and the calyx lobes being much shorter than the calyx tube.

STERCULIA HOSEI sp. nov.

Arbor, ramis admodum incrassatis, ramulis dense castaneo-pubescentibus; foliis ovatis ad oblongo-obovatis, chartaceis, 28 ad 32 cm longis, utrinque plus minusve stellato-pubescentibus, subtus ferrugineis, basi rotundatis ad truncato-rotundatis, 3-nervis, apice tenuissime caudato-acuminatis, nervis utrinque 7 vel 8, perspicuis; petiolo 7 cm longo; paniculis angustissimis, 8 ad 11 cm longis, densissime castaneo-pubescentibus; floribus circiter 12 mm longis, castaneo-pubescentibus, lobis erectis vel patulis, lineari-lanceolatis, 10 mm longis; ovario dense fulvo-hirsuto.

A tree, the branches somewhat thickened, reddish brown, rugose, glabrous, the ultimate branchlets about 6 mm in diameter, densely castaneous-pubescent. Leaves ovate to oblong-obovate, chartaceous, 28 to 32 cm long, the base rounded to broadly truncate-rounded, 3-nerved, the apex very slenderly caudate-acuminate, the acumen about 3 cm long and 1.5 mm wide, the upper surface pale greenish when dry, stellate-pubescent with short scattered hairs, the midrib rather densely castaneous, stellate-pubescent, the lower surface pale brownish, ferruginous-pubescent with stellate hairs which are more numerous on the midrib, nerves, and primary reticulations; lateral nerves above the basal pair 7 or 8 on each side of the midrib, prominent, somewhat curved, anastomosing very close to the margin, the reticulations distinct; petioles about 7 cm long, thickened at the base and apex, ferruginous-pubescent. Panicles very narrow, almost

racemelike, 8 to 11 cm long, all parts very densely castaneous-pubescent with stellate hairs, the branches at most 5 mm long, 1- to 3-flowered. Flowers about 12 mm long, very densely castaneous-pubescent with stellate hairs, the tube broad, about 3 mm long, the lobes free, erect, ultimately spreading, not at all cohering, linear-lanceolate, acuminate, about 10 mm long. Ovary ovoid, densely fulvous-hirsute, the stalk glabrous, about 2.5 mm long; style densely fulvous-hirsute, recurved, about 3 mm long. Staminate flowers similar to the perfect ones, the androphore glabrous, about 3.5 mm long.

Sarawak, Baram District, *Hose 97*, March, 1915.

This species is characterized by its very slenderly caudate-acuminate leaves and its racemelike, relatively short panicles. It is apparently as closely allied to *Sterculia scortechinii* King as to any other described species.

STERCULIA LONGIPETIOLATA sp. nov.

Arbor inflorescentiis leviter castaneo-pubescentibus exceptis glabra; ramulis circiter 1 cm diametro, stipulis numerosissimis circiter 5 cm longis, anguste lanceolatis, glabris acuminatis; foliis oblongo-obovatis, longe petiolatis, subcoriaceis, acuminatis, basi leviter cordatis, circiter 50 cm longis, nervis utrinque circiter 10, valde perspicuis; paniculis tenuibus, angustis, circiter 30 cm longis, leviter castaneo-pubescentibus; floribus circiter 8 mm longis, lobis lineari-lanceolatis, arcuatis, coherentibus, 3.5 mm longis.

A tree, nearly glabrous except the somewhat castaneous-pubescent inflorescences. Ultimate branches terete, about 1 cm in diameter, somewhat pubescent, terminated by a dense crown of narrowly lanceolate, coriaceous, glabrous, brown, shining, slenderly acuminate stipules or stipulelike bracts about 5 cm long, 6 to 8 mm wide. Leaves oblong-obovate, subcoriaceous, acuminate, base rounded or slightly cordate, up to 50 cm long and 20 cm wide, pale brownish when dry, shining, glabrous or the midrib beneath slightly stellate-pubescent with scattered ferruginous hairs; lateral nerves about 10 on each side of the midrib, very prominent, curved, anastomosing, the reticulations very distinct on the lower surface; petioles 9 to 12 cm long, stout, thickened at base and apex, slightly pubescent, ultimately glabrous. Panicles rather slender, narrow, about 30 cm long, somewhat castaneous-pubescent, the branches spreading, 2 to 4 cm long. Flowers slightly pubescent, about 8 mm long, the tube oblong-ovoid, the lobes linear-lanceolate, hirsute inside, about

3.5 mm long, arched, cohering by their apices. Androphore about 1.5 mm long, bearing a globose head of 10 anthers about 1 mm in diameter.

Sarawak, 1752 native collector. British North Borneo, Batu Lima, *Agama* 1001, October, 1920, *Ramos* 1487, 1723, 1725, October and November, 1920. In damp forests along streams at low altitudes.

This species is strongly characterized by its rather long-petioled, nearly glabrous leaves and by the dense crown of stipules or stipulelike bracts which terminates the branchlets.

STERCULIA MEMBRANACEA sp. nov.

Frutex vix 1 m altus, partibus junioribus inflorescentiisque leviter pubescentibus, ramis ramulisque tenuibus; foliis oblongis, membranaceis, glabris, nitidis, olivaceis, 12 ad 20 cm longis, basi angustatis, acutis vel leviter obtusis, apice contractis et abrupte rostrato-acuminatis, nervis utrinque 8 ad 10; paniculis tenuissime pedunculatis, 7 ad 10 cm longis; floribus extus glabris, tenuiter pedicellatis, 5 ad 8 mm longis, lobis lineari-oblongis, arcuatis, coherentibus, tubo aequantibus.

A shrub, less than 1 m high according to the collector, the younger parts including the inflorescences slightly pubescent. Branches slender, terete, about 2 mm in diameter, glabrous, the tips of the branchlets slightly pubescent. Leaves oblong, membranaceous, glabrous on both surfaces, olivaceous, shining, 12 to 20 cm long, 4 to 8 cm wide, the base narrowed, acute or slightly obtuse, the apex abruptly contracted and rostrate-acuminate, the acumen about 1 cm long, 2 to 3 mm wide, obtuse; lateral nerves, 8 to 10 on each side of the midrib; petioles slender, glabrous or nearly so, 1 to 3 cm long. Panicles terminal, very slender, peduncled, 7 to 10 cm long, slightly pubescent, the branches few, spreading, 2 cm long or less. Flowers white, externally glabrous, about 7 mm long, their pedicels filiform, 5 to 8 mm long. Calyx tube subovoid, the lobes linear-oblong, arched, cohering, about as long as the tube, hirsute. Androphore about 1.5 mm long, the anthers crowded in a globose head about 0.5 mm in diameter.

British North Borneo, Labuk and Sagut Districts, *Castillo* 665, September 21, 1918. In flat country of the Sumawang watershed, altitude about 20 meters.

This species is closely allied to the Philippine *Sterculia graciliflora* Perk., from which it is especially distinguishable by its more-numerous lateral nerves.

STERCULIA YATESI sp. nov.

Frutex vel arbor parva, inflorescentiis exceptis glabra; stipulis numerosis, lanceolatis, acuminatis, circiter 5 mm longis; foliis chartaceis oblanceolatis, utrinque angustatis, 20 ad 30 cm longis, brevissime petiolatis, tenuiter acuminatis, nervis utrinque 15 ad 20, perspicuis; paniculis angustis, 15 ad 25 cm longis, in ramis defoliatis dispositis, bracteis numerosis stipuliformibus lanceolatis acuminatis 1.2 ad 2 cm longis subtensis; floribus circiter 17 mm longis, tenuiter pedicellatis, tubo cylindraceo, lobis curvatis, vix coherentibus, circiter 8 mm longis; fructibus anguste oblongis, basi angustatis, extus dense ferrugineo-puberulis, acutis, circiter 9 cm longis; seminibus circiter 6.

A shrub or small tree, 2 to 5 m high, glabrous or nearly so except the somewhat pubescent inflorescences, the branches terete, 4 to 7 mm in diameter, the tips of the branchlets usually glabrous and supplied with a crown of short, lanceolate, coriaceous, acuminate, stipulelike bracts, about 5 mm long. Leaves chartaceous, oblanceolate, slenderly and sharply acuminate, narrowed at both ends, the base 5 mm wide or less, obtuse, 20 to 30 cm long, 5 to 10 cm wide, brownish or olivaceous, shining, entirely glabrous on both surfaces or the upper surface slightly pubescent on the midrib; lateral nerves 15 to 20 on each side of the midrib, prominent, curved, anastomosing, the reticulations distinct; petioles glabrous or when young somewhat pubescent, 3 to 5 mm long. Specialized leafless branchlets bearing the inflorescences 8 to 15 cm long, up to 4 mm in diameter, glabrous, bearing at the apex a crown of rather rigid, narrowly lanceolate, glabrous, acuminate, brownish bracts about 1.2 to 2 cm long which subtend one to several narrow panicles, 15 to 25 cm in length, the panicles somewhat castaneous-pubescent, their branches divaricately spreading, distant, few-flowered, 2.5 cm long or less. Flowers purplish, about 17 mm long, their pedicels slender, 5 to 13 mm long. Calyx tube cylindric, the base cuneate, externally somewhat pubescent, the lobes curved, arched, not at all cohering or if so only in young bud, oblong-lanceolate, hirsute inside, about 8 mm long. Androphore glabrous, 3 mm long, the anthers 10, crowded in a globose head about 1.5 mm in diameter. Fruit narrowly oblong, somewhat compressed, usually solitary, the base narrowed into a stipe, dark red when fresh, externally densely ferruginous-puberulent, inside glabrous, apex acute, about 9 cm long and 2 cm wide. Seeds about 6, somewhat ellipsoid, about 1 cm long.

British North Borneo, Sapeng, *Yates 21* (type), October 17, 1917, in forests, altitude about 250 meters; Sandakan, Suanlamba watershed, *Agama 578*, August 21, 1918, on ridges, altitude about 15 meters, in fruit; Sarawak, Baram District, Selungo, *2817 native collector*, November 25, 1914.

This species is apparently most closely allied to *Sterculia spatulata* Warb. of the Sulu Archipelago, from which it differs in its more-numerous lateral nerves and apparently also in the specialized leafless branchlets which are terminated by a crown of narrowly lanceolate brown bracts subtending the panicles.

SAURAUIA Willdenow

SAURAUIA AGAMAE sp. nov.

Frutex perspicue adpresse-setosus; foliis chartaceis, oblongis ad oblongo-lanceolatis, usque ad 20 cm longis, basi acutis, apice tenuiter subcaudato-acuminatis, subtus adpresse-setosis; nervis utrinque 15, perspicuis; inflorescentiis cymosis, 7 ad 10 cm longis, lateralibus fasciculatis, terminalibus solitariis, dense adpresse-setosis, bracteis linearis, 4 ad 10 mm longis; sepalis extus dense adpresse-setosis; staminibus 20; ovario glabro; stylis 3, liberis.

A shrub 1 to 1.5 m high, the branchlets, petioles, leaves on the lower surface, and the inflorescences conspicuously appressed-setose, the upper surface of the leaves glabrous except the appressed-setose midrib. Leaves chartaceous, oblong to oblong-lanceolate, 13 to 20 cm long, 4 to 7 cm wide, narrowed below to the acute base and above to the slenderly subcaudate apex, the margins somewhat spinulose-setose, the upper surface shining, grayish olivaceous when dry; lateral nerves about 15 on each side of the midrib, prominent on the lower surface, somewhat curved, scarcely anastomosing, the reticulations distinct, the setae on the lower surface mostly confined to the midrib, nerves, and reticulations; petioles 1 to 3 cm long, ultimately becoming nearly glabrous. Inflorescences cymose, peduncled, in lateral fascicles on the older branches and sometimes also terminal, when terminal usually if not always solitary, 7 to 10 cm long, rather many-flowered, lax, rather densely appressed-setose and also pubescent, the indumentum pale brownish; bracts linear, setose, up to 1 cm in length. Flowers white, their pedicels 4 to 10 mm long. Sepals oblong to oblong-ovate, acute, 3 to 4 mm long, the outer 3 densely setose, the inner 2 narrower and with glabrous margins. Petals 5, oblong, about 6.5 mm long, 3 mm

wide, the apex subtruncate and slightly retuse; stamens 20, the anthers oblong, 2.5 mm long. Ovary ovoid, glabrous; styles 3, free, 3 to 3.5 mm long.

British North Borneo, Sandakan, *Agama* 569, August 4, 1918. In flat country of the Suanlamba River valley at low altitudes.

This species resembles *Saurauia acuminata* Merr., but its indumentum is very different, the setae being much shorter and appressed; the cymes much longer; and the styles free to the base.

RINOREA Aublet.

RINOREA CASTILLOI sp. nov. § *Pentaloba*.

Arbor parva, novellis inflorescentiisque minute pubescentibus exceptis glabra; ramis pallidissimis, ramulis sulcatis vel compressis; foliis chartaceis, oblongis ad oblongo-ellipticis, 20 ad 30 cm longis, basi angustatis, acutis, apice acuminatis, margine minute et distanter glanduloso-serrulatis, nervis utrinque circiter 15, perspicuis; inflorescentiis axillaribus, solitariis vel fasciculatis, racemosis vel depauperato-paniculatis, paucifloris, quam petiolis brevioribus; sepalis late ovatis, rotundatis, leviter pubescentibus, circiter 3.5 mm longis.

A tree about 8 m high, entirely glabrous except the minutely pubescent tips of the growing branchlets, the stipules, and the sparingly pubescent inflorescences. Branches very pale, terete, sparingly lenticellate, branchlets compressed or sulcate. Leaves chartaceous, rather pale when dry, oblong to oblong-elliptic, 20 to 30 cm long, 7 to 11 cm wide, subequally narrowed to the acute base and to the somewhat acuminate apex, the margins entire or minutely and distantly glandular-serrulate; lateral nerves about 15 on each side of the midrib, conspicuous, the reticulations distinct on both surfaces, subparallel; petioles 2 to 3 cm long; stipules lanceolate, slenderly acuminate, about 7 mm long, minutely pubescent, somewhat keeled and longitudinally striate. Inflorescences sparingly pubescent, racemose or depauperate-paniculate, 2 cm long or less, solitary or few in each axil. Flowers perfect, their pedicels about 4 mm long; bracts ovate, acuminate, somewhat keeled, about 2 mm long; bracteoles similar to the bracts but much smaller, 1 mm long or less. Sepals 5, about 3.5 mm long, broadly ovate to reniform-ovate, rounded, slightly pubescent. Petals ovate, glabrous, rounded, 3 mm long (not quite mature). Stamens about 1.8 mm long, the filaments very short, the dorsal appendage of the connectives broadly ovate, obtuse, brown, 1 mm long, the terminal appendages of the anther cell 0.5 mm long, linear or linear-lanceolate. Ovary ellipsoid,

1 mm long, very obscurely pubescent above; style as long as the ovary.

British North Borneo, Sandakan, Suanlamba watershed, *Castillo 618*, August 22, 1918. At the base of a rocky ridge, altitude about 20 meters.

This species is distinctly allied to the Philippine *Rinorea acuminata* Merr. but differs in being nearly glabrous and by its much longer petioles; the leaf axils beneath are not glandular or bearded.

ALANGIUM Lamarck

ALANGIUM MEYERI Merr. in Govt. Lab. Publ. (Philip.) 35 (1905) 54; Wang, in Engl. Pflanzenreich 41 (1910) 15.

British North Borneo, Suanlamba River, *Agama 560*, August 7, 1918. A widely distributed Philippine species, this being its first extra-Philippine record.

DIOSPYROS Linnaeus

DIOSPYROS TOPSIODES King & Gamble in Journ. As. Soc. Bengal 74² (1905) 223.

British North Borneo, Suanlamba River, *Castillo 638*, August 26, 1918, with the Malay name *kayu arang*.

Malay Peninsula (Perak). I suspect that the Bornean specimen, *Beccari 3052*, referred by Hiern to the Indian *Diospyros topsia* Ham. will prove to be this species rather than the one Hamilton described.

TABERNAEMONTANA Linnaeus

TABERNAEMONTANA POLYSPERMA sp. nov.

Frutex glaber, ramis ramulisque tenuibus; foliis brevissime petiolatis, in paribus aequalibus vel leviter inaequalibus, membranaceis, oblongis ad oblongo-obovatis, usque ad 24 cm longis, utrinque angustatis, basi acutis, apice tenuiter caudato-acuminatis, nervis utrinque 15 ad 20, tenuibus, curvatis; cymis axillaribus, pedunculatis, laxis, paucifloris, 12 ad 14 cm longis; floribus circiter 2.5 cm diametro, corollae tubo 2 ad 2.5 cm longo; folliculis divaricatis, subcylindratis, 4 ad 5 cm longis, circiter 2 cm diametro, obscure tricarinatis, acutis, pericarpio crustaceo; seminibus circiter 20.

A glabrous shrub about 3 m high, the branches and branchlets slender, terete, or the branchlets somewhat compressed, the internodes 6 to 13 cm long. Leaves in equal or somewhat unequal pairs, membranaceous, oblong to oblong-obovate, 7 to 24 cm long, 3 to 9 cm wide, narrowed at both ends, the base acute,

apex slenderly caudate-acuminate, the acumen 1 to 2 cm long, usually falcate; lateral nerves 15 to 20 on each side of the midrib, slender, curved; petioles 2 mm long or less. Cymes axillary, peduncled, lax, few-flowered, 12 to 14 cm long, 10 to 12 cm wide, the peduncles 6 to 8 cm long. Flowers white, the corolla tube 2 to 2.5 cm long, the lobes spreading, somewhat obovate, up to 1.5 cm long. Follicles few, subcylindric, divaricate, 4 to 5 cm long, about 2 cm in diameter, acute or subacute at both ends, the back broadly rounded, the ventral surface obscurely 3-keeled, the pericarp fragile, smooth, pale brownish, shining. Seeds about 20, angular, about 1 cm long, the aril orange yellow.

British North Borneo, Sumawang watershed, Labuk, *Castillo* 667, September 24, 1918, on ridges at low altitudes; Batu Lima and Sibuguey, *Ramos* 1633, 1714, November, 1921.

This species is well characterized by its membranaceous, many-nerved, subsessile, caudate-acuminate leaves; its obscurely keeled, subcylindric follicles; and its numerous seeds.

PREMNA Linnaeus

PREMNA GLANDULOSA sp. nov.

Arbor parva, inflorescentibus exceptis glabra; ramulis haud lenticellatis; foliis firmiter chartaceis, oblongo-ellipticis, 13 ad 17 cm longis, integris, nitidis, basi rotundatis ad acutis, apice perspicue lateque acuminatis, subtus minute distincteque glanduloso-punctatis, nervis utrinque 6 vel 7, perspicuis; cymis terminalibus, puberulis, pedunculatis, multifloris, 13 cm latis; floribus breviter pedicellatis; calycis cupulatis, truncatis; corolla 5 ad 5.5 mm longa, glabra; fructibus globosis ad obovoideis 3.5 mm longis.

A small tree about 6 m high, entirely glabrous except the cinereous-puberulent inflorescences. Branches terete, smooth, brown when dry, the upper parts not at all lenticellate. Leaves firmly chartaceous, oblong-elliptic, olivaceous when dry, 13 to 17 cm long, 6 to 8.5 cm wide, entire, shining, base rounded to acute, apex rather prominently and broadly acuminate, the lower surface minutely but distinctly glandular-punctate; lateral nerves 6 or 7 on each side of the midrib, prominent on the lower surface, curved, anastomosing, the reticulations lax, distinct; petioles 1.5 to 2 cm long. Cymes terminal, peduncled, many-flowered, about 13 cm wide, 5 to 8 cm long, excluding the peduncle, the branches opposite, the lower ones up to 8 cm in length, the bracts linear, about 4 mm long, bracteoles very small. Flowers

white, distinctly pedicelled, the pedicels about 1 mm long. Calyx shallowly cup-shaped, glabrous or very slightly pubescent, truncate, not at all or but very obscurely toothed, about 1.5 mm in diameter. Corolla 5 to 5.5 mm long, 2-lipped, glabrous or nearly so, the upper lip 1.8 to 2 mm long, broadly ovate, rounded, retuse, the lower lip 3-lobed, the lobes ovate, rounded, 1.2 to 1.5 mm long. Style 4.5 mm long. Anthers slightly exserted. Fruits globose to slightly obovoid, about 3.5 mm long.

British North Borneo, Sandakan, Suanlamba watershed, *Castillo 652*, August 25, 1918. On ridges, altitude about 10 meters.

This species is manifestly allied to *Premna kunstleri* King & Gamble of the Malay Peninsula, but the leaves are usually acute, sometimes rounded at the base but never subcordate, the corolla is glabrous, or at most with very few short scattered hairs above, while the fruits are much smaller.

CLERODENDRON Linnaeus

CLERODENDRON PANICULATUM Linn. Mant. 1 (1767) 90; C. B. Clarke in Hook. f. Fl. Brit. Ind. 4 (1885) 593.

British North Borneo, Sandakan, *Castillo 598*, January 30, 1918. On level land near the seashore.

The species is new to Borneo. Burma, Siam, and Cochinchina, southward to the Malay Peninsula, Java, and Ternate.

PSYCHOTRIA Linnaeus

PSYCHOTRIA AGAMAE sp. nov.

Frutex scandens, glaber, ramis ramulisque tenuibus, internodiis 2 ad 6 cm longis; foliis membranaceis, oblongis, nitidis, 4 ad 7 cm longis, basi plerumque acutis, apice late obtuseque acuminate, nervis utrinque 6, tenuibus, vix anastomosantibus, reticulis obsolete; infructescentiis pedunculatis, laxis 6 ad 7 cm longis; fructibus oblongo-obovoideis, deorsum angustatis, basi acutis, 1 cm longis, 6 mm diametro, perspicue 8-sulcatis; seminibus perspicue sulcatis; albumine aequabile.

An entirely glabrous, woody vine, the branches slender, terete, pale, smooth, the internodes 2 to 6 cm long. Leaves membranaceous, oblong, shining when dry, 4 to 7 cm long, 2 to 3 cm wide, rather pale when dry, the base usually acute, apex broadly and obtusely acuminate; lateral nerves 6 on each side of the midrib, slender, curved, scarcely anastomosing, the reticulations obsolete; petioles 3 to 7 mm long; stipules 1.5 mm long or less, somewhat sheathing, wider than long; infructescences terminal, peduncled, rather lax, 6 to 7 cm long, the peduncles 2.5 to 3.5 cm long, the branches usually 5, opposite,

each bearing three fruits, the lower ones 3 cm long or less. Fruits oblong-obovoid, narrowed below to the acute base, 1 cm long, about 6 mm in diameter, prominently sulcate, the apex rounded, the ridges usually 8. Seeds plano-convex with two conspicuous dorsal and two marginal ridges, the albumen uniform.

British North Borneo, Sandakan, *Agama* 570, August 13, 1918. In flat country in the Suanlamba River valley, slightly above sea level.

This species has the habit and somewhat the general appearance of *Psychotria sarmentosa* Blume but is not closely allied to that species as the albumen is not at all ruminant. It is well characterized by its slender stems; its membranaceous, slenderly nerved leaves, the reticulations being entirely obsolete; and its oblong-obovoid, prominently sulcate fruits and prominently sulcate seeds.

SCHISTOSOMIASIS IN THE PHILIPPINE ISLANDS¹

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FIVE PLATES

Schistosomiasis is considered as being of very infrequent occurrence among natives of the Philippine Islands, and its endemic nature has not been established. Up to the present only two cases of infection with *Schistosoma japonicum* had been reported at autopsy, one by Woolley (35) and the other by Phalen and Nichols. (31) It might be mentioned that Garrison (15) and Willets (34) have seen the ova of *S. japonicum* a number of times in their routine examinations of stools. Study of some post-mortem cases in our department of pathology and bacteriology has enabled us to report ten more instances of this infection in native Filipinos who have never been out of this country.

It is the purpose of this paper to give a general survey of the life history of *S. japonicum* and an account of the pathology and morbid anatomy of schistosomiasis in man, in addition to the case reports.

LIFE HISTORY OF SCHISTOSOMA JAPONICUM

The eggs in utero are soft, and vary in number from 50 to 300 (2) (Plate 5, fig. 1). Extra-utero they are oval, faintly yellow, and double contoured, 83.5 by 62.5 μ , and have small lateral spines or thickenings, and at the opposite side caplike thickenings (Plate 5, fig. 3). In the opinion of Cort (7) the spines are variable and not of specific value. He noted that the surface of the shells of the eggs appeared to be covered with some sort of sticky substance and that the miracidia (larvæ) were motionless and completely filled the shells when examined fresh from the faeces; however, when placed in water the eggs begin to swell, leaving a considerable space between the miracidium and the shell filled with granules and oil globules extruded from the anterior ducts of the miracidium. The ciliated miracidium becomes active,

¹ Read before the Fifth Assembly of Physicians and Pharmacists, Manila, February 7, 1922.

often turning completely around; finally, the egg splits, freeing it. Cort believes that the splitting is not caused by the activity of the embryo, but the action of water, and quotes Smith as saying that the process of expansion takes place at about 30° C. in from ten to twenty hours.

Miyura and Sudzuki⁽²⁹⁾ demonstrated that the free-swimming animalcule penetrates its intermediate host, *Blanfordia nosophora* (a kind of sharply conical, dark gray snail, with a dextral opening and with seven or eight coils), by dissolving its cuticle and neutralizing the secretions of the host with the secretion of its own cephalic glands. Once it has gained entrance, it makes its way to the gills and wall of the alimentary canal where in twelve days the first radiæ appear. Gradually these concentrate in the bile ducts, where they grow and form secondary radiæ, or the sporocysts of Leiper. When fully developed the cercariæ escape from the snail and penetrate the skin of the vertebrate host (which in his case were mice), causing the disease schistosomiasis.

The anatomical structure and locomotion of both miracidium and cercaria are splendidly described by Cort.⁽⁶⁾ The mode of penetration through the skin is described by him as follows: The cercaria takes hold with the ventral sucker and, by extending its body and by butting with the spines of the tips arranged around the openings of the ducts of the cephalic glands, produces a slight opening. Aided by the cytolytic and neutralizing secretions of these glands, and by the backward-pointing spines, the cercaria is able to penetrate the host. Once inside, the cephalic glands and the tail degenerate. At this stage, the sexes cannot be distinguished.

Miyagawa and Takemoto⁽²⁸⁾ trace the worms making their way into the lymphatic spaces; for the most part they invade the blood capillaries or the small peripheral veins, later accumulating in the right side of the heart. From the skin they may pass through the lymph vessels to the lymphatic glands in which many are arrested and killed. The worms that enter into the peripheral veins reach the right side of the heart and pass directly to the lungs, where they are arrested for a short time because of their size. Finally, they return to the left side of the heart, pass into the aorta, and are distributed to the gastrointestinal canal and from here to the liver through the mesenteric veins, or else directly from the aorta into the liver by the hepatic artery. The latter route would place the worms

in the arterial channels of the gastrointestinal tract as well as in the venous side, which is in accord with the findings of Phalen and Nichols⁽³¹⁾ and of Catto.

The adult male is flat, 9 to 12 millimeters in length by 0.5 millimeter in breadth. The female is 12 to 26 millimeters in length by 0.4 millimeter in breadth, according to Manson.⁽²⁴⁾ Fantham, Stephens, and Theobald⁽¹³⁾ give as extreme limits 5 to 22.5 millimeters and, for the female, up to 26 millimeters.

The adult males, obtained from autopsy 9132, measure from 6 to 9 millimeters (Plate 5, fig. 2), and one of the females measures 20 millimeters (Plate 5, fig. 1). The females are longer and thinner than the males. The middle portion of the female is thicker than the anterior or the posterior, and the surface is smooth. The oral sucker is smaller than the ventral, and both are armed with fine spines. The uterine canal is straight, commences as a little pouch about the middle of the body, and ends in a point below the ventral sucker. The ova at this place are in pairs and have their long axes parallel to the long axis of the uterine canal. There is a slight constriction of the canal between the four pairs of ova so that they look like coffee beans, as they are flat on the line of apposition. The next ova have their long axes diagonal to the axis of the canal. Below them there is a slight constriction of the canal and the portion posterior to this is more dilated than that above or anterior to it. The ova in this dilated portion look larger, have their long axes either parallel or diagonal to the axis of the canal, and lower down they are in twos or threes, and in various positions. About the middle of the body or a little below, the elliptical ovary is well marked with its pointed end anterior. The large end is posterior and from this a tube winds upward to join the end of the uterus. Another tube, which is thicker than the one mentioned, runs downward into the branched vitellarium. The junction of these tubes with the uterus is partly covered from view by the clear racemose shell gland. The habitat of the worms, according to Manson,⁽²⁴⁾ is the smaller mesenteric blood vessels, especially those draining the large intestine. Immature ones may be present in the portal and splenic veins, also in the gastric veins and in the coats of the small intestines, and even in the coronary veins of the heart. In this series, the adults were found in the portal vein of the liver in the first case, and in the tenth case in the portal vein and in the branches of the splenic vein.

DEPOSITION OF EGGS

Letulle(21) says that the worms migrate to the smaller veins; on account of the larger size of the male, he is left behind, while the female continues her migration until she comes to a small vessel, which she blocks, causing stasis of the vessel. Attaching herself to the intima of the vessel she evacuates her ova, the spines of which, aided by the pressure of the blood, are enabled to pierce the walls of the vessels, and the whole mass of ova is forced into the perivascular tissue.

Fairly(11) examined fresh pieces of bowel infected with *Bilharzia hæmatobia* [*Schistosoma hæmatobium*] and describes the process as follows:

When the time for oviposition arrives the paired worms travel against the direction of the blood stream to the furthestmost possible point. Hence the female leaves the male partner and being of a much narrower calibre, works her way into veins of small diameter, distending them in the process and only stopping when the mechanical resistance is too great for further progress. Here she deposits an ovum always in a characteristic fashion, the spine being directed posteriorly. The reason for this is that the ovum lies in a similar position in the uterus of the female. The female then slightly withdraws. *Pari passu* the distended vessel wall contracts down on the ovum. Again the female deposits an egg and withdraws, and again the vessel wall contracts down on the foreign body. In *Bilharzia hæmatobia* infestation many eggs are deposited in this fashion, so that microscopically the venule, with its contained ova, presents the appearance of a string of sausages. Probably local vascular spasm is a big factor in the production of this picture. When the female finally withdraws from the branched venule the blood current, which has in the meantime been held up, assumes its normal course, driving the ova before it. The spines which point in the direction of the blood stream, and are in close apposition with the walls of the venule, naturally pierce the latter structure and are then driven into the perivascular tissue.

Whether the worms of *Schistosoma japonicum* are found in the venous or in the arterial side, it seems to me that the female worm, by blocking the smallest arteriole, or venule, causes an anæmia. After depositing an egg or a mass of eggs she withdraws, and the blood rushes in and drives one or many ova through the wall of the vessel which has been weakened by the temporary anæmia and probably by the secretion of the contained miracidium or by some secretion from the mother discharged with the ova. In this way, the ova pass into the perivascular area. Once in the stroma of the intestinal mucosa, either the ova are expelled into the intestinal canal by the contractions of the intestinal wall or they cause necrosis and an inflammatory reaction; and, by the rupture of the small ab-

cesses thus formed, the ova are discharged into the lumen of the intestinal canal or into the peritoneal cavity.

Lanning, (18) from an examination of pathological slides, thinks that a mass of ova collects in the lymphatics of the intestinal submucosa, which causes pressure necrosis of the surrounding tissue, and so the mass of eggs is extruded into the bowel lumen. This accounts for the fact that ova are very often not found in the stools for a long period of time and, again, will be discovered in a small quantity of blood and mucus in large numbers.

REACTION OF THE DEFINITIVE HOST

Local necrosis is produced either by the toxic substance secreted by the contained miracidium in the ovum or by the pressure of the ovum or ova. The toxin plus the necrotic substances probably exert a chemotactic influence on the endothelium leucocytes, on the eosinophile leucocytes, plasma cells, lymphocytes, and fibroblasts. An isolated ovum is usually encircled by foreign-body giant cells, and in many instances one cannot but believe that these giant cells are formed by the coalescence of endothelial leucocytes. Sometimes the ovum is completely dissolved by these cells, as demonstrated by the pieces of transparent shell in their cytoplasm (Plate 3, fig. 1). In case the injury is severe and one or two foreign-body giant cells are not sufficient to counteract the injurious agents, then the lesion produced, as well as the tissue reaction, is similar to the infective granulomata. In the periphery of the eosin-stained necrotic center are epithelioid cells, giant cells, fibroblasts, and eosinophile leucocytes. They are inwrapped by circularly arranged fibroblasts and eosinophiles which merge into the outermost zone of fibrous tissue, eosinophiles, and small lymphocytes.

Should the nodule be located near a mucous surface, secondary pyogenic infection may take place and the nodule may either ulcerate or perforate, as in autopsy 4676, where a generalized suppurative peritonitis was apparently caused by the presence of masses of ova in all the coats of the appendix. In many instances an ovum or a mass of ova becomes encapsulated by fibrous tissue and eosinophiles and undergoes calcification. In the long run the outcome of this type of lesion is marked fibrosis.

Fairly, (12) in his investigation of immunity reactions in Egyptian bilharziasis, found that the cellular reaction is charac-

terized by eosinophilic leucocytosis and a corresponding increase in eosinophilic myelocytes in the bone marrow. This eosinophilic leucocytosis is well demonstrated in the cases reported, except in the cases of typhoid fever, in which the lesions indicate that the infection of *Schistosoma japonicum* preceded that of typhoid, as demonstrated by the encapsulated eggs, and suggest that the typhoid anaphylatoxin (Friedberger, 14) exerts a negative chemotaxis, not only toward the neutrophiles, but also toward the eosinophilic leucocytes.

HUMORAL REACTION

The researches of Fairly(11) on the complement-deviation reaction in bilharziasis by using an alcoholic saline soluble extract of the livers of infected snails of the species *Planorbis boissyi*, which is the intermediate host of *Schistosoma hæmatobium*, showed that the higher the eosinophilia the greater the amount of complement fixed, although some without eosinophilia also yielded positive reactions. He emphasized the fact that this serological phenomenon is of the nature of a group reaction, and does not enable one to differentiate the members of the species. In investigating the serological response in experimentally infected monkeys, he found that monkeys could be killed by hyperinfection before there was time for ova to be deposited in their tissues. The animals died either before there was time for an immunity response to develop or, if they survived longer, the intensity of the toxæmia often caused a complete depression of the mechanism of immunization. In all monkeys recovering spontaneously from the disease a remarkable cellulohumoral reaction was present. In every case there was positive complement deviation, and the bone marrow showed marked increase in eosinophilic myelocytes and also cellular proliferation and increase in the normoblastic tissue.

CLINICAL SYMPTOMS

In view of the fact that the number of cases reported in this paper seems to indicate that the infection is not altogether foreign to these Islands, a review of the clinical symptoms as described by other writers will be of some profit to our practitioners.

Lanning(18) divides his cases into three stages: The initial stage, marked by high afternoon temperature lasting from three to six weeks, comparatively slow pulse rate, evanescent

oedemas and urticarias, pains in the abdomen, generally in the upper part, cough with evanescent areas of pulmonary dullness, diarrhoea or constipation, marked eosinophilia, and often mental depression. The second stage is marked by enlarged liver and spleen, with a heavy feeling in the upper abdomen, marked eosinophilia and some anæmia, loss of weight, slight degree of fever at some particular time of day, passage of blood-streaked mucus containing the ova in the stools, more or less tenesmus and straining at stool, sometimes diarrhoea or constipation. A man generally gets better after several weeks or months in this stage, but may go on to the terminal stage after from three to five years, especially if reinfectd several times. The terminal, or third, stage is marked by cirrhotic liver, sometimes enlarged, sometimes shrunken, ascites, oedematous extremities, marked emaciation, anæmia, weakness, passage of blood and mucus in the stools, and sometimes a little fever. The man may die of exhaustion or of some terminal infection.

As the ova do not appear in the stool much before the third week, the diagnosis in the first-invasion stage rests largely on the probability of exposure, the typical rash, the high evening temperature with attendant constitutional symptoms, the morning feeling of comparative well-being, and, last but perhaps more important and constant, eosinophilia. The ova may appear in the stool once, and not again for a comparatively long period of time. The incubation period, according to Lanning, is about twelve days.

Houghton,(17) in his notes on infection with *Schistosoma japonicum*, classifies the clinical symptoms as follows:

(a) Typical cases with enlarged liver and spleen, hydroperitoneum, and blood stools, 40 per cent.

(b) Cases showing only splenic enlargement with or without blood in the stools, 27 per cent. The eosinophilia in these cases will differentiate them from malarial cachexia or other condition.

(c) Cases with cerebral symptoms and a high grade of eosinophilia. He says that the cerebral lesion of his only case does not prove its connection with the flukes, but Tsunoda has recorded a brain involvement and thinks it is conceivable that a high pyrexia might stimulate the passing of great numbers of ova into the blood stream, to be swept outward and lodged as emboli elsewhere.

(d) Cases negative, except for marked eosinophilia, 25 per cent. The discovery of the trematode infection was incidental in these cases, and these make bad surgical risks, for the relative increase of eosinophile cells is at the expense of the polynuclear neutrophiles, presumably diminishing the power of this bodily defense against bacterial invasion.

(e) Latent cases, showing ova in the stools, but no bodily reaction, 5 per cent. One case gave a history of recurrent dysenteric seizures. The most important points clinically, according to Houghton, are:

1. The presence of ova in the stools. Not always easy to show.
2. A high grade of eosinophilia, ranging from 10 per cent to 50 per cent.
3. Greatly exaggerated knee jerks, which occur in practically every case.
4. Lack of anaemia. The average haemoglobin index was 80 per cent, but there is a peculiar muddiness of complexion that often suggests anaemia.
5. Lack of leucocytosis.² Unless complicated by some purulent process, the leucocytes remain at or below normal.
6. Emaciation, not to be accounted for in other ways, is occasionally a feature.

To this classification Bovaird and Cecil(1) add the terminal cases characterized by portal obstruction, advanced anaemia, and death by exhaustion. They believe that the ascites is due to liver cirrhosis, endophlebitis, and thrombosis of the portal vein by the ova.

The experience of Houghton(17) in examining stools for ova is worth mentioning, for these may be more readily mistaken for *Ascaris lumbricoides* than for *Ankylostomum* eggs. When the mammillary envelope of *Ascaris* egg is not deeply bile-stained and the bosses are not prominent, the two may be difficult to distinguish. The novice would be likely to mistake a *Schistosoma* ovum for such an *Ascaris* egg, and neglect to turn on the high power.

REPORT OF CASES

Infection with *Schistosoma japonicum* has been reported from the Philippine Islands.

Wooley in 1906(35) described the autopsy findings in a native Filipino who had not been out of the Islands and who at the time of death was a prisoner in Bilibid. This investigator foretold that other cases would be found here.

Heiser in 1908(16) reported fifteen cases from the inmates of Bilibid Prison.

In the same year Garrison(15) reported the result of a statistical investigation conducted during the year 1907 among 4,106 prisoners from all parts of the Islands, including a number of Chinese and a few Americans in Bilibid Prison. *Schistosoma*

² The studies of Chamberlain, Am. Journ. Trop. Dis. and Prev. Med. 2 (1914) 41, on blood of Filipinos, showed an absolute reduction in efficient phagocysts. In the unpublished studies of Leach, Ash, and Haughwout the polymorphonuclear counts vary from 34 to 65 per cent, and are mainly below 60 per cent.—M. P. M. G.

japonicum occurred only among Filipinos and on an average of 0.4 per cent. Excepting one case from Manila, all infections appear to have originated on the three southern islands; namely, Samar, 6 cases; Leyte, 5; and Mindanao, 4.

Phalen and Nichols⁽³¹⁾ in the same year (1908) published the record of a case, a native of Calbayog, Samar, who had lived continuously in that town until his twenty-fourth year. He then enlisted in the Philippine Scouts and, during the six years of his service, was stationed on Panay, Cebu, Leyte, and Samar, and came to Manila for short visits only.

In 1909 Strong,⁽³³⁾ in his medical survey of the town of Taytay, Rizal Province, Luzon, mentions a case of dysentery caused by *Schistosoma japonicum* which was not contracted in Taytay, and states that *S. hæmatobium* had only been found in Manila in instances where the infection had originated in foreign countries.

Crowell and Hammack in 1913⁽⁹⁾ mention a case of *Schistosoma japonicum* in a Filipino, 18 years old, observed in the laboratory of the College of Medicine and Surgery, University of the Philippines, by Dr. V. L. Andrews. A detailed report of this case will constitute the first of the series discussed in the present paper.

In 1914 Willets⁽³⁴⁾ found three cases among 7,843 prisoners examined upon admission to Bilibid Prison. These cases came from Manila, Leyte, and La Union.

P. Guazon reported to the Manila Medical Society in 1918 a case of chronic obliterative appendicitis in a young man, 22 years old, who was a resident of Quiapo, Manila, at the time of operation. Histological sections of the appendix showed complete obliteration of the lumen and the presence of ova of *Schistosoma japonicum* situated singly and in groups in its wall.

The ten cases reported in this paper were autopsied in the morgue of the College of Medicine and Surgery, University of the Philippines, which is, at the same time, the City Morgue of Manila, and the autopsies were performed by the members of the staff of the department of pathology and bacteriology.

FIRST CASE

Clinical history.—F. B., Filipino male, 18 years old, residing in Paco, Manila, complained of restlessness and difficulty of breathing. No history could be taken, for patient refused to talk. Admitted to the Philippine General Hospital, December 23, 1912.

After a few hours in the hospital the patient died, with the diagnosis of mitral stenosis and acute passive congestion of the liver. The necropsy was performed, nine hours after death, by Dr. V. L. Andrews.

Morbid anatomy.—Autopsy 2191. Body is that of a well-nourished and well-developed muscular Filipino. Considerable increase of clear yellowish fluid in the peritoneal cavity. The sigmoid shows the presence of three large and hard nodules, measuring from 2.5 to 3 centimeters in diameter, attached to its serous coat in the line of the appendices epiploicæ (Plate 1, fig. 1). The intestinal wall at this portion is thickened. The lymph nodes in the mesocolon opposite these tumors are slightly enlarged but not extraordinarily so. As the palpating finger passes over them they feel like small grains of sand or miliary tubercles. The appendix is 11 centimeters long; it is free except for the attachment of its mesocolon, which is rather prominent. Two centimeters from its beginning there is a slight stricture in the appendix; at its distal point it is enlarged, measuring 1.3 centimeters in diameter; it is rather firmer than normal. Five centimeters from its distal end there is another enlargement which measures 1.5 centimeters in diameter. This is also firm, and corresponds in feeling and appearance to the nodules that were found on the sigmoid. The liver is roughened and rather firmly attached by adhesions to the undersurface of the diaphragm.

Pericardial sac shows an increase of a greenish yellow fluid which contains a few flocculi. The right side of the heart is considerably dilated and hypertrophied.

The left lung is bound by numerous fibrous adhesions to the parietal wall, practically obliterating the pleural cavity. Parietal pleura is much thickened. The lung is light purple, crepitant for the most part, but there are a few nodules present; these are in the anterior portion of the lower lobe and lower anterior portion of the upper lobe. The two lobes are bound together by firm adhesions. The nodules that were noticed are on the surface, and the visceral pleura covering them has a mottled, yellowish appearance. Section through the nodules shows a yellowish gray appearance but apparently no increase of fibrous tissue. Another section through the nodule reveals yellowish gray areas, apparently of necrosis. These are irregular in outline, most of them communicating with the surface, but some are deeper in the tissues. The edges of these gray nodules are yellower than the central portion. Section through the lung substance shows a peculiar mottling of dark red lung tissue with darker hæmorrhagic areas scattered here and there. Considerable increase of fluid is present in the right pleural cavity. One small nodule was encountered in the central portion of the upper lobe of the right lung.

Spleen is bound by adhesions to the abdominal wall and diaphragm and is removed with difficulty.

Liver measures 2.5 by 17 by 9.5 centimeters. Liver surface is very rough, covered by numerous tags and adhesions which contain considerable œdematous fluid (Plate 1, fig. 2). The edges of the liver are rounding. Where adhesions are not present, the liver is dark brown. Capsule is thickened. The liver oozes considerable blood. The cut surface is moist and firm, and a few old scar formations are present in its substance (Plate 2). Most of these are darker than the surrounding tissue. A few pinpoint, grayish white areas are scattered through the liver substance. The lobulation of the liver is not clearly defined. Liver weighs 1,617 grams.

Urinary bladder contains some turbid urine. Mucosa normal.

Rectum.—The lower part shows the presence of a few hæmorrhagic areas and one internal hæmorrhoid measuring about 0.7 centimeter in diameter.

Intestines.—The wall of the ileum is somewhat thickened, especially the serous coat. A large number of *Trichuris* worms are present in the cæcum. The appendix shows a definite thickening of the appendicular walls at the two enlargements noted in the description of the peritoneum. It is cut with considerable resistance and is almost fibrous, but the cut surface is rather dry and does not appear to be very fibrous. The mucosa at this point seems to be intact but is dark colored. Lumen is patent. In the cæcum there are one or two small enlargements of the mucosa. These appear to be in the mucous coat proper. No ulcerations. Beginning with the lower part of the descending colon (Plate 1, fig. 3), extending through the sigmoid and into the rectum, there are numerous small enlargements of the mucosa extending into the lumen of the gut. These are very irregular in outline and in size, measuring from 3 millimeters to 1 centimeter in diameter; most of them seem to be confined to the mucous membrane, looking more like mucous polyps; some, however, are attached to the muscular layer by firm adhesions. Section through the nodules noticed on the external surface of the lower part of the sigmoid shows a definite tumor formation—bands of connective tissue between which cellular tissue is present. It is attached to the serous coat of the intestine.

Lymph nodes.—The lymph nodes in the mediastinum are all enlarged and somewhat oedematous. Retroperitoneal lymph nodes over the lumbar vertebrae and up as far as the coeliac axis are all enlarged; some of them are somewhat oedematous, others in the mesocolon of the sigmoid are slightly enlarged and very firm. In sectioning through them, the knife meets with considerable resistance, almost as though it were calcareous material, and in some considerable yellowish necrotic material is present. The lymph nodes surrounding the bile ducts and the pyloric end of the stomach are enlarged. On section these are very cellular, moist, and glistening. The mesenteric lymph nodes are enlarged and show on section marked hyperæmia.

HISTOPATHOLOGY

Lung.—With the lower power, the section shows areas of partial atelectasis and emphysema, and marked congestion of the blood vessels and capillaries. The bronchioles show desquamation of epithelium and congested wall. Irregularly disseminated in the field are various nodules in different stages of formation, which at first sight look very much like miliary tubercles. On close inspection, however, one sees that the giant cells are of foreign type and many either are trying to envelop an ovum or contain yellow transparent pieces of shells. Another feature is the presence of eosinophiles in the fibrous tissue wall (Plate 3, fig. 2).

Another nodule (Plate 3, fig. 1) shows central necrosis and a zone of radiating epithelioid cells with a large foreign-body giant cell at one side, toward which many of the epithelioid cells around it are directed. At the periphery of this zone of epithelioid cells are many foreign-body giant cells, which seem to be formed by their coalescence. The next zone is formed by circular fibroblasts and eosinophiles and merges with the outermost zone composed of fibrous tissues, eosinophiles, and small lymphocytes.

Another large nodule is seen with a central area of necrosis in which one can see some well-stained eosinophiles. In the periphery of this there are radial epithelioid cells, eosinophiles, large foreign-body giant cells, and a piece of yellow shell. These are all encapsulated also by concentric layers of fibroblasts, in which eosinophiles, a few plasma cells, and small lymphocytes are found, in the order named from the center outward. The lung tissue under high power shows marked hæmorrhage by diapedesis and marked eosinophilia in the neighborhood of the nodules.

Large areas of necrosis are also found on section of the lungs. The necrotic center is eosin stained and is composed of different kinds of cells undergoing degeneration. No trace of the framework is seen in it. This is also encapsulated by a few epithelioid cells, giant cells, fibroblasts, fibrous tissue, plasma cells, and eosinophiles. In this fibrous capsule there are calcified ova, which are walled off by fibroblasts, plasma cells, and eosinophiles. The lung tissue around these necrotic areas is atelectatic with much fibrosis, and contains many eosinophiles.

The nodules are located in the lung tissue, singly or conglomerated; a few are near the large blood vessel, but none was found in the wall of the bronchi, bronchioles, or blood vessels.

The eggs occur singly or in groups of three, and the highest number was seven. None is seen in the interlobular septa, pleura, or wall of blood vessels and bronchi.

An isolated egg is sometimes found in a septum, and the cells next to the egg stain pink, are granular, and have no nuclei. The shells of the ova are yellowish and transparent, with a thick border, or rim. They are usually wrinkled, but in the shells of those that are distended no spines can be detected or recognized; when these are seen the cytoplasm is opaque, eosin stained, and globular, or slightly oval. Eccentrically placed is a group of minute blue-stained chromatin bodies. This arrangement is probably due to the angle at which the egg is sectioned, for in many ova the chromatin bodies are centrally placed. Many of the isolated ova are accompanied by single foreign-body giant cells which have the tendency to encircle the ova and dissolve them.

The egg in the histological sections measures 80 by 38 microns.

Liver.—Single and conglomerate nodules with single ova or groups of ova are found in the interlobular and intralobular septa. Many of the ova are calcified, and a few nodules have undergone hyaline transformation. The sinusoids are filled with blood, and the liver cells are smaller than normal and show fatty degeneration. In one of the sections of the portal vein a cross section of an adult worm is present (Plate 4, fig. 2); this is flat and thin, with margins turned ventrally inward, one being deeper than the other. About the middle there are two small ductlike openings (Plate 4, fig. 1).

Colon.—The submucosa is thicker than normal, due to a dense deposit of ova, eosinophiles, and fibroblasts. Areas of necrosis similar to those found in the lung are also present in the submucosa. Almost all the ova are calcified. The mucosa shows catarrhal desquamation, marked infiltration of eosinophiles, and few ova in the stroma. The muscularis is free from ova. The polypoid growth of the serosa is made up of fibrous tissue, fibroblasts, eosinophiles, groups of ova, round-cell infiltration, and areas of necrosis.

Mesenteric lymph nodes.—Groups of ova are found in the border line of the cortex and medulla, encapsulated by fibrous tissue with few eosinophiles. Isolated ova are also found outside the capsule without any sign of reaction around them. Another group of ova is also present in the medulla with giant cells and without any capsule. The sinuses are dilated and filled with lymphocytes and eosinophiles. Other sections of mesenteric lymph nodes are completely packed with eggs, especially the medullary portion. Many of the follicles are intact, but others contain ova; even the capsule is not free from them.

Peribronchial lymph nodes.—Eosinophilic infiltration.

Heart.—Eosinophilic infiltration in the septa, and congestion.

Spleen.—Congestion and fibrosis.

Kidney, testes, pancreas, and prostate are free from ova and do not have eosinophilic infiltration. Sections stained by Willyoung's method (35) show brilliant red ova and clear blue tissue.

ANATOMIC DIAGNOSIS

Acute dilatation and hypertrophy of right heart; acute dilatation of left heart; chronic myocarditis; hydropericardium; chronic endocarditis; congestion of lungs with slight hæmorrhages; chronic obliterative pleurisy, left; hydrothorax, right; necrotic nodules, two, left; chronic passive congestion of spleen; chronic perihepatitis; chronic passive congestion of kidneys; chronic perisplenitis; cirrhosis of the liver; mucous tumors of sigmoid; tumor in appendix; ascites; acute lymphadenitis, retroperitoneal, mesenteric, and celiac axis; oedema of mediastinum; congestion of meninges and brain substance; uncinariasis trichocephalasis; ascariasis; schistosomiasis.

In this case we have an adult worm in the portal vein of the liver, ova in the liver, mesenteric lymph nodes, and colon, with eosinophilic infiltration in these organs and in the peribronchial lymph nodes and heart. There is absence of ova and eosinophilia in the kidneys, testes, prostate, pancreas, and spleen. The gross pathological anatomy is that of a terminal case of infection with *Schistosoma japonicum*.

SECOND CASE

F. V., Filipino male, 18 years old, residing in Tondo, Manila, died of electrocution on June 12, 1914.

Morbid anatomy.—Autopsy 3241. Body is that of an adult, male Filipino, 150 centimeters in length and weighing 43.49 kilograms. On the anterior aspect of the thorax there is a large gaping wound, which extends completely across the thorax and through its entire depth as far posteriorly as the vertebral column, completely severing all structures. The pleuræ are firmly adherent to the thoracic wall and diaphragm.

Intestines.—Some of the epiploic appendices are firm and pale. In the ileum there is marked prominence of the lymphoid tissue, which is pale. In the cæcum and extending throughout the entire colon there are numerous groups of nodules, which are small, discrete, conglomerate, elevated, conical, with for the most part umbilicated centers. These form irregular

groups, the individuals of which are blackish and greenish. There are also three or four polypoid rounded excrescences of the mucosa in the colon. Between these the mucosa is apparently slightly thickened and there are other rounded pale elevations which apparently represent nodules beneath the mucosa. The mesocolic, mesenteric, and retroperitoneal glands are slightly enlarged; they are firm and yellowish gray. The vermiform appendix is somewhat dilated tortuous and has surrounding adhesions causing its distortion. Minute dissection of the mesentery, mesocolon, and mesenteric and mesocolic glands fails to reveal the presence of any parasites visible to the naked eye.

Liver is rather small and is surrounded by firm adhesions binding it to the diaphragm. In the middle of the anterior surface of the left lobe is a rather deep incisure with rounded margin, the base of which is formed by fibrous tissue. The organ is firm, the capsule thickened, and the surface nodular and yellowish brown. The nodules vary from a few millimeters to several centimeters in diameter. The depressions between them are not deep. On section the liver is firm and cuts with considerable difficulty. The cut surface is yellowish brown, and the liver lobules are not distinct. There are large thick strands of fibrous tissue scattered irregularly throughout the organ, and in the parenchyma are fairly soft yellowish areas which are not elevated, averaging from 3 to 5 millimeters in greatest diameter. These are very numerous and widely scattered throughout the organ. There is some pale firm tissue about the branches of the portal vessels within the liver. No parasite is found in the intrahepatic vessels or bile ducts. Liver weighs 1,195 grams.

NOTE.—Scrapings from the nodules in the large intestine contain eggs of *Schistosoma*, apparently *japonicum*.

ANATOMIC DIAGNOSIS

Electrical burn of thorax, arms, thigh, heart, lungs, aorta, and vertebrae; chronic polypoid colitis; schistosomiasis; chronic interstitial hepatitis (schistosomiasis); chronic perihepatitis; congestion of stomach and duodenum; chronic lymphadenitis (mesenteric, mesocolic, and retroperitoneal); fatty degeneration of kidneys.

NOTE.—The liver shows portal cirrhosis and the presence of ova.

THIRD CASE

Clinical history.—J. A., male Filipino, 23 years of age, single, born in Samar, now residing in Manila, complained of fever and headache. Date of admission to the Philippine General Hospital, July 9, 1915.

Present illness.—Five days ago had headache, coldness of the body, and chill followed by fever. He did not have any pain in the joints nor cough. The chill appeared again and recurred two or three times daily. He was constipated for about four days.

Physical examination.—Slight dyspnea, no cyanosis. The circulatory and respiratory systems are apparently normal. The pulse is small and frequent, but regular. The lower border of the spleen is one finger below the costal margin. Sensorium is clear; knee jerks are diminished.

July 9, 1915.—Convulsions in the upper extremities and eyes staring upward. Neck is rigid, Kernig's sign is positive. Pulse is filiform. No fluid comes out from the lumbar puncture. Temperature is 40 to 41° C.

Laboratory examination.—Urine shows decided trace of albumen and abundant red blood cells. The white count is 8,600, with 49 per cent poly-

nuclears, 31 per cent transitionals, 11 per cent small lymphocytes, 7 per cent large lymphocytes, 1 per cent eosinophiles, and 1 per cent mast cells. Smears from the blood are negative for all types of malaria. Widal reaction is negative.

Clinical diagnosis.—Malaria, cerebral type, and meningitis.

Morbid anatomy.—Autopsy 4087. Body of a poorly nourished, adult, Filipino male. The abdominal cavity itself is dry and sticky. The appendix is retrocæcal, extends almost to the liver, and is bound by fibrous adhesions. The colon is considerably enlarged; it fills the entire pelvis, and the loops are adherent to each other and to the surrounding tissue and bladder by means of a sticky sero-fibrinous material. The appendices epiploicæ upon the colon are considerably enlarged and in some places matted together. Abdominal viscera lie in normal relationship to each other. The right pleural sac contains some adhesions posteriorly.

Intestines.—The entire wall of the colon is considerably thickened and somewhat firm in consistency. The mucosa of the colon appears to be thickened and in the rectum has a bluish red tinge, is somewhat elevated in slight nodular masses which are of a somewhat polypoid appearance, while throughout the remaining portion of the colon the mucosa is thrown into very prominent rugæ and has a pale color with areas of pinkness, is moist, and shows no further growth or change. The appendix is thickened, rather firm in consistency, and considerably elongated. The mucosa of the ileum is altered over the lower 1.5 to 2 meters. Covering this area there are about fifteen Peyer's patches which are elevated from 3 to 5 millimeters above the surrounding mucosa, and much of the solitary lymphoid tissue over this part of the intestine is elevated likewise.

The lymph nodes throughout the mesentery are much enlarged; the largest measures about 4 centimeters in diameter. All of these glands are dark bluish externally, and on section show a pale pinkish surface which bulges, and on some of the cut surfaces there are smooth, deep red areas 2 to 3 millimeters in diameter from which blood-tinged fluid oozes.

Liver.—The common bile duct is patent. The liver itself weighs 1,677 grams; it is firm in consistency, the capsule is bluish gray, and the surface is somewhat roughened by pale, opaque, anastomosing bands of tissue, giving the surface a somewhat nodular appearance; there are also some depressed puckering scar areas, and beneath the capsule minute yellowish areas 1 to 2 millimeters in diameter are visible, which are diffused irregularly over the entire surface. Section into the liver shows it to be cut with some resistance; the cut surface is marked in many places with pale dense strands of tissue, and dark red areas which vary in size from a few millimeters to 1.5 centimeters, and diffused over the entire cut surface there are yellowish areas 1 to 2 millimeters in diameter. The lobules are faintly visible; some have a yellowish brown tint, others have a reddish color. There are also pale strands of tissue extending into the liver from the capsule.

Urinary bladder contains some amber-colored urine. The mucosa is pale and smooth.

HISTOPATHOLOGY

Liver shows focal areas of necrosis, typhoid; congestion; cloudy and fatty degeneration; portal cirrhosis, schistosomiasis. Nodules with well-formed clear or calcified ova, resembling those of autopsy 2191, are found in the interlobular septa and in the lobule containing foreign-body giant

cells, fibroblasts, fibrous tissue, and small lymphocytes, but no eosinophiles. Isolated ova are seen in the peripheral and intermediary zones of the liver lobule without any cellular or fixed tissue reaction around any one of these. Focal necrosis is present near the nodules located in the lobule, and in a few instances a single ovum is found in the area of necrosis showing signs of degeneration and disintegration.

Intestines.—Hyperplasia of the lymphoid follicles and ulcerative enteritis, typhoid. Groups of ova in the submucosa, muscularis mucosæ of the colon, without any fixed tissue or cellular reaction can be recognized. A slight coagulation necrosis only is present in the area occupied by the ova. As in the first case, isolated ova are lodged now and then in the stroma of the mucosa. Many are found around a lymphoid follicle, but in no instance is any found inside. Almost all the ova are well preserved, clear, not wrinkled, and in none is a spine detected. The muscular and serous coats are free from ova.

Mesenteric and hæmolymp nodes. Single ova and groups of ova are deposited in the medulla.

The other organs are free from ova and eosinophilic infiltration.

ANATOMIC DIAGNOSIS

Acute enteritis, acute splenitis, typhoid; fibrosis of the liver; polypoid colitis, schistosomiasis; ankylostomiasis; trichocephaliasis.

Sections show characteristic lesions of typhoid and the presence of ova in the liver, colon, mesenteric lymph node, and hæmolymp node, either singly or in groups without the presence of eosinophiles. Presence of calcified ova in the liver and old fibrous nodules indicates that the infection with *Schistosoma japonicum* took place before infection with typhoid. What is the cause of the disappearance of the eosinophiles in the field? The presence of ova without any tissue reaction suggests that they are freshly laid. The lesions are not so far advanced as in the first two cases.

FOURTH CASE

Clinical history.—Bureau of Prisons No. 33742, male, Filipino, 18 years old, laborer, single, born in Samar. Admitted to the Philippine General Hospital May 31, 1915, complaining of pain in the abdomen, and fever.

Had malaria at 11 years of age. He was seldom ill and only with occasional fevers. Had no smallpox nor dysentery.

A few hours after supper the previous night he felt acute pain in the abdomen which became generalized all over the hypogastrium. On account of this pain, he was given a purgative. His bowels moved at midnight, but the pain became worse. The pain and tenderness became intolerable. Next morning he was given an enema, but his condition became worse. His temperature became high, and he vomited several times. He was then taken to the Philippine General Hospital.

Patient is well developed and well nourished, feels nauseated and vomits greenish yellow fluid with food and mucus. The abdomen is as high as the thorax and is tympanitic. Rigidity is more marked in the lower half of the abdomen, and the tenderness is more marked in the hypogastrium.

Laboratory examination.—May 31, 1915. White count, 15,100; polynuclears, 88 per cent; small lymphocytes, 8 per cent; and transitionals, 4 per cent.

June 2.—High fever, delirious, pain persistent, relieved by ice cap. Tenderness marked in the right iliac region.

June 10.—Restless and weaker. White count is 38,200.

Clinical diagnosis.—Peritonitis, acute; appendiceal abscess.

Morbid anatomy.—Autopsy 4676.—An undersized male adult Filipino with sunken abdomen and rigid musculature. The peritoneal cavity contains about 3 liters of greenish creamy material; the coils of the intestines are adherent to each other, and the serosa presents a necrotic appearance. The omentum is thick, blue, cordlike, and attached to the right iliac region. On looking for the source of this suppurative process, the appendix is found elongated and retrocaecal, and 1.5 centimeters below its tip is an oval opening which has perforated all the walls of the appendix. The mesenteric lymph nodes are all enlarged and deep red. The peribronchial glands and bronchial glands are all enlarged and deep purple.

The spleen is enlarged, the capsule is pale bluish, and numerous fibrous tags are found attached to the wrinkled capsule.

The liver is covered with pus, especially the anterior surface and the dome. It cuts easily, and the cut surface is swollen, pinkish yellow, and pale. The lobulations are not distinct. The liver weighs 1,503 grams.

Stomach contains about 1 liter of dark green fluid. The mucosa and wall of the intestine are oedematous, but there is no ulcer anywhere. The ileocaecal valve is especially oedematous, and the opening is very small. On opening the appendix the wall of the proximal part is found to be 4 to 6 millimeters in thickness, and firm and hard; the mucosa is white and thick, but the distal part is gangrenous and, as noted before, an opening is found near the tip which is about 7 to 8 millimeters in diameter, having its longest axis parallel to that of the appendix.

HISTOPATHOLOGY

Liver.—Foreign giant cells containing shells enveloped by old fibrous tissue and small lymphocytes. Single ova and groups of ova in the portal and interlobular septa. Isolated ova in the periportal zone of the lobule. Capsule covered with fibrino-purulent exudate.

Intestines.—Groups of from 6 to 34 ova are found in the thickened submucosa, mostly below the muscularis mucosae. In the muscularis they are enveloped with fibrous tissue, lymphocytes, and few eosinophiles. Serosa shows congestion, and fibroblast and many plasma cells, the capillaries are congested with red and polynuclear cells. The exudate is composed of fibrin and dead cells.

Appendix.—Groups of ova are found in all the coats. Signs of acute fibrino-purulent inflammation are also present.

The other organs are free from ova and eosinophilic infiltration.

ANATOMIC DIAGNOSIS

Acute fibrino-purulent peritonitis; perforation of the appendix; schistosomiasis; fibrosis of the spleen with enlargement; chronic interstitial nephritis; dilatation of the heart.

The abdominal pain complained of by this individual suggests that it was probably caused by the deposition of ova in the wall

of the ileocaecal valve. The administration of the purgative undoubtedly aided the intestinal contractions and the expulsion of the ova into the intestinal lumen and peritoneal cavity. Both processes weakened the intestinal wall, allowing in this way the intestinal bacteria to gain a foothold not only in the intestinal wall but also in the peritoneal cavity, either directly or through the lymphatics. This case and the one reported by Dr. P. Guazon place this infection as one of the etiological factors of appendicitis.

FIFTH CASE

B. M., male Filipino, 57 years old, residing in San Nicolas, Manila, died suddenly in the Luneta Police Station on February 5, 1918, due to severe hæmorrhage from the lungs.

Morbid anatomy.—Autopsy 5948. A fairly developed, but greatly emaciated, Filipino adult. The appendix is long, pointed toward the pelvic region, and there are some fibrous adhesions at the base. Fibrous adhesions bind the anterior surface of the liver to the diaphragm. The right lung is firmly adherent to the thoracic wall. The left lung is voluminous, grayish, and shows old scars in the middle of the upper lobe. Another scar is found below and anterior to it. There are also old scars in the lower lobe. Fibrous thickenings of the visceral pleura are found in the apex of the superior lobe of the right lung and also in the middle of the lower lobe. Firm nodules which seem to contain minute sandlike material are present in the anterior surface of the superior lobe. Section of the superior lobe of the left lung reveals a large cavity, just below the scar, containing caseated material. Around this cavity and in the septa of the lungs there are large, solid, fibrous bodies. Lower lobe shows a mottled appearance of swollen red lung tissue and fibrous tubercles, especially in the septa and around the bronchi. Right lung is firmly adherent to the thoracic wall, and is completely fibrous and covered by a thick pleura. A cavity, about 7 centimeters in diameter, is found in the apex of the superior lobe. This cavity has many fibrous cords running through it, and the wall is rugged and fibrous.

The spleen is small and pale purple.

The liver is small, soft, flabby, and pale, and the anterior surface is covered by fibrous tissue. The liver cuts easily, and the cut section is pale brownish, soft, and swollen. Liver weighs 1,520 grams.

Intestines contain yellowish, acid, fæcal material; otherwise, they are apparently normal.

HISTOPATHOLOGY

Liver.—In the peripheral zone of the lobule were seen isolated single ova, sometimes without any cellular reaction and sometimes with a giant cell around the ovum; in the portal areas or beneath the capsule of the liver were groups of ova, varying in number from two to fourteen, inclosed in a thin capsule of fibrous tissue that contained round cells and eosinophiles. Section of nodules contained fibroblasts, eosinophiles, and round-cell infiltration without any trace of ova. Fatty infiltration in the peripheral zone of the lobules, and congestion and dilatation of the portal veins are seen.

Lungs.—Groups of freshly laid ova in the wall of the cavity which is infiltrated with small lymphocytes, eosinophiles, giant cells, and polynuclear leucocytes. The lung tissue and wall of cavity contained a great number of acid-fast tubercle bacilli.

Spleen.—Marked fibrosis, eosinophilia, pigmentation, hyaline degeneration of the blood vessels, and minute tubercles which contained acid-fast bacilli.

ANATOMIC DIAGNOSIS

Anæmia, secondary; hæmorrhage, pulmonary; dilatation, heart; ulcerative and fibro-caseous tuberculosis, lungs; miliary tuberculosis, lungs and spleen; fibrosis, right pleura and Glisson's capsule; chronic interstitial nephritis; parenchymatous degeneration, heart, liver, and adrenals; schistosomiasis, liver and lung.

SIXTH CASE

S. M., 27 years of age, Filipino, laborer, residing in Ermita, Manila, was admitted to the Philippine General Hospital on February 5, 1919, complaining of severe headache, moderate fever, and chilly sensation. Last November he had influenza. He had cough, fever for fifteen days, but no chest pain. The attack was not severe according to the patient, yet after the febrile period he felt weak and had to stay in bed until last January. Since this attack he has been coughing. Two days before admission he had chills and headache. The duration of the chills was one and one-half hours, and afterward the headache was very severe. Patient states that he had frequent headaches before the present illness. He is able to sit up in bed, but cannot walk on account of his weakness.

His eyes react well, the right has poor vision; both are congested and watery. There is slight rigidity and also tenderness in the right mastoid region. The liver and spleen are not palpable. Kernig's sign is slightly positive, patellar reflexes are diminished, ankle clonus and Babinski's sign are absent. He is conscious and irritable.

February 11, 1919.—Patient tends to sleep; if asked the reason, he says that he feels well. At times he talks nonsense when asked if he is out of his mind.

February 12, 1921.—Patient was in good condition this morning, but at 1 o'clock this afternoon he had sudden tonic convulsions, and expired shortly after.

Laboratory examination.—Urine negative for albumen and sugar, rare hyaline casts, and few red blood cells.

The temperature was 39.5° C. on admission; it became subnormal in the early part of the mornings and rose to 38° C. in the afternoons.

Clinical diagnosis.—Influenza, with pneumonia and cardiac failure; uræmia?

Morbid anatomy.—Autopsy 6862. A well-developed, well-nourished Filipino male, adult. The left arm is more contracted than the right. The peritoneal cavity does not contain any fluid. Appendix is long and retro-cæcal. Mesenteric lymphatic glands are enlarged and soft. The right pleural cavity is completely obliterated. The right lung is small, and the left is slightly voluminous. A triangular area in the anterior portion of the left upper lobe is held by fibrous adhesions to the thoracic wall. This portion is firm and fibrous and shows on section dilated bronchi and thick, fibrous tissue around each bronchus.

Chronic fibrous tubercles, some of which contain small amounts of calcareous material in the center, are present in the right lung. The bronchi contain much mucus, and the mucosa is congested. The peribronchial lymph nodes are slightly enlarged. The lymph nodes around the diaphragmatic arch are enlarged and yellowish.

The spleen is very small, wrinkled, and dark blue; it weighs 85 grams.

The liver is larger than normal; it is dark blue and mottled with minute pearl-like dots. These are definitely circumscribed and vary in color from bluish opalescent to opaque pale yellow. The liver cuts easily, and the cut section shows some areas of hæmorrhages. The liver tissue is friable, soft, and dark blue; the lobules are not distinct. The liver weighs 1,390 grams.

Alimentary system shows marked congestion and the presence of ascaris, trichuris, and ankylostoma; otherwise it is apparently normal.

Brain.—On removing the dura the brain presents an opaque, swollen, uniform grayish yellow tissue with very shallow sulci. On removing the brain from the skull a small puncture was made into the right temporal lobe from which a thick greenish fluid came out. This fluid has no odor and contains large green clumps. The brain has a more-dilated right hemisphere, and on section through it the temporal lobe shows a greenish purulent material and necrotic brain tissue. The peduncle of this side is also swollen and opaque, and there are many petechial hæmorrhages in it. The left petrous bone is congested, but the right contains necrotic material. A careful examination shows that the right ear has a slight discharge. Smears from the exudate show many streptococci and long fine bacillary forms. Cultures were found positive for streptococci and *Bacillus influenzae*.

Histological sections from the intestines and mesenteric lymph nodes were not taken.

HISTOPATHOLOGY

Liver.—Congestion and numerous nodules of different sizes containing ova.

Lung.—Large areas of necrosis, similar to those of the first case, containing dead and well-preserved foreign-body giant cells, catarrhal cells, plasma cells, eosinophiles, and round-cell infiltration, walled off by granular tissue where cells of the same type can be recognized. Sections stained for acid-fast bacilli are negative. No ova, however, can be seen in the sections. The triangular area in the left lung shows marked fibrosis in the interlobular septa, in the wall of the bronchioles, and in the alveolar septa near these structures.

Brain.—Polynuclear-cell infiltration in the swollen walls of the congested capillaries. Section of the large area of necrosis shows a wall similar to that found in the lung. No ovum is seen in the section.

ANATOMIC DIAGNOSIS

Abscess, brain; dilatation of the heart; bronchiectasis and interstitial pneumonia, local, lung; chronic adhesive pleurisy; schistosomiasis.

It has been mentioned before that hyperpyrexia may favor the dissemination of ova. Is the necrosis in the brain and in the lung of this case caused by emboli of ova which became infected afterward with pyogenic microorganisms? Are these

purely bacterial in origin? Fibrosis of the lungs is a common finding after influenza,⁽²⁶⁾ yet the presence of giant cells and eosinophiles indicates that the injurious agent which attracted them is not far away.

SEVENTH CASE

Clinical history.—T. A., 22 years of age, single, Filipino sailor, residing in Binondo, Manila; admitted to the hospital on June 30, 1921, complaining of fever, headache, and abdominal discomfort. The fever was of eight days' duration; continuous and moderate in degree. Since the onset of the disease patient has had no desire for food; he suffers from constipation at times, alternating with diarrhoea. Patient is complaining of pain in the chest. He does not cough. On physical examination dullness is noted and crepitant râles heard in the base of the right lung. Similar râles are heard in the left interscapular region. Heart beats fast, without murmurs. Abdomen is distended and flatulent.

July 2, 1921.—Patient is delirious. Abdomen is distended and tympanic. Marked dullness at the right base with few occasional râles. Heart beats are fast, pulse is soft. At noon he passed a slightly coffee-colored bloody stool.

July 3, 1921.—Abdomen tympanic and slightly rigid. Marked tenderness in the right iliac region. At 3 p. m. had profuse bleeding from the gums. Bladder is distended.

July 5, 1921.—Unconscious; respiration rapid and deep. Heart is galloping, but heart sounds are distinct and free from murmurs. Rhythm normal.

Abdominal examination reveals nothing.

Temperature varying from 38.5° to 39.5°.

Urine, acid, albumen positive, slight sugar, some hyaline and abundant granular casts. Sugar probably due to hypodermoclysis with lactose.

Fæces, negative.

Blood culture on July 6, 1921, was negative.

Agglutination tests for *Bacillus typhosus* and for *B. paratyphosus* A and B were negative.

Blood counts: Leucocytes, 6,000; neutrophiles, 52 per cent; small lymphocytes, 36 per cent; large lymphocytes, 11.5 per cent; basophiles, 0.5 per cent.

Clinical diagnosis.—Fever, typhoid; severe toxæmia; pneumonia, hypostatic, bilateral; hæmorrhage, intestinal.

Morbid anatomy.—Autopsy 8470. The findings are those of typhoid with œdema and congestion of the lungs.

HISTOPATHOLOGY

Liver.—Hæmangioma; focal necrosis, typhoid; large *Schistosoma* nodules without eosinophilic infiltration and few giant cells; in the mesenteric lymph nodes, *Schistosoma* nodules and focal areas of necrosis. Some eggs with giant cells are also seen in the periphery of the areas of focal necrosis due to typhoid. Marked œdema and congestion are seen in the sections of the lungs, but no ova. Sections of the other organs are free from ova and eosinophilic infiltration.

ANATOMIC DIAGNOSIS

Intestinal hæmorrhage; acute ulcerative enteritis, acute lymphadenitis, acute splenitis, typhoid; schistosomiasis; hæmangioma, liver.

EIGHTH CASE

T. A., male, 65 years old (?), Filipino, laborer, was found unconscious in Plaza Goiti, Manila. Admitted to the Philippine General Hospital on November 25, 1921. He is well built, robust, and well nourished. Right pupil is smaller than the left which is distinctly dilated. Eyeballs are prominent and the intraocular pressure is increased. Patient is snoring. Area of dullness of the heart is slightly increased to the left. Heart beat is slow, with an extra systole every five or ten beats. Liver and spleen not palpable. Both extremities of the right side are paretic and placid; patient unable to extend or flex them as he can those of the left side. Radial artery is rigid and cannot be compressed. Blood pressure: Systolic, 230 millimeters; diastolic, 100 millimeters.

Blood examination: White count, 27,000, with 93 per cent neutrophiles, 4 per cent small lymphocytes, and 3 per cent large mononuclears.

Urine examination, albumen, very strongly positive; specific gravity, 1,006; casts, hyaline and granular; sugar, negative.

Clinical diagnosis.—Cerebral hæmorrhage, arteriosclerosis, and chronic interstitial nephritis.

Morbid anatomy.—Autopsy 8716. A well-developed and well-nourished, old Filipino man. The peritoneal cavity does not contain any fluid. The intestinal coils are pinkish and apparently normal. The urinary bladder is distended with urine, otherwise it is apparently normal. The spleen is very small and attached with fibrous adhesions to the surrounding tissue. The left pleural cavity is completely obliterated by fibrous adhesions. The heart is very large and slightly hypertrophied. Arteriosclerotic patches are found in the aorta and in the aortic valves. The left side is slightly atelectatic on account of the thick fibrous pleura. In the posterior surface of the inferior border of the superior lobe there is a piece of the lung and pleura which has changed into bone. The liver is soft and flabby and apparently normal in size. On section it shows congested surface. The liver weighs 1,468 grams. The alimentary tract is apparently normal.

The brain shows meningeal hæmorrhages in the left hemisphere and over the cerebellum. Section of the left side shows a large clot of blood in the internal capsule, and the left ventricle is completely filled with blood. The corpus collusum is intact. The right side shows a small amount of bloody fluid, but no destruction of brain tissue.

HISTOPATHOLOGY

Liver.—Few isolated ova in the portal areas with scanty cellular reaction.

ANATOMIC DIAGNOSIS

Cerebral and meningeal hæmorrhages, left; dilatation and hypertrophy of the heart; arteriosclerosis, senile; chronic interstitial nephritis; acute congestion of the lungs; obliterative pleurisy; ossification of lung, local; atrophy of the spleen; distension of the urinary bladder; schistosomiasis, liver.

NINTH CASE

Clinical data.—B. S., male, 25 years old, Filipino, foreman, residing in Manila, was admitted to the Philippine General Hospital on January 27, 1914, complaining of fever, chest pain, and cough.

Physical examination indicates lobar pneumonia, acute pericarditis, and dilatation of the heart.

Leucocytic count, 32,050 per cubic centimeter, and blood smear is negative for all the forms of malaria.

Stool examination is negative.

Urine contains a decided trace of albumen and few pale granular casts.

Morbid anatomy.—Autopsy 2990. Body of an emaciated adult, male Filipino, with about 100 cubic centimeters of clear yellowish fluid in the pericardial cavity, and fibrinous exudate over the surface of the right lung. The right ventricle of the heart is dilated. Right lung shows fibrinous pleurisy and lobar pneumonia. Liver weighs 1,607 grams. The lower edge is 8 centimeters below the costal ribs. There are areas of depression over its surface. It is brownish gray, hard, and firm; the surface is granular. On section numerous yellowish areas are present on the cut surface. In the sigmoid there is a hard nodule, which on section shows clear fluid surrounded by a thick capsule. Round worms and whipworms are present in the intestines.

HISTOPATHOLOGY

Liver.—*Schistosoma* nodules in the interlobular septa and fatty degeneration. Lung, red hepatization. The nodule in the sigmoid is composed of fibrous tissue with a cavity in the center containing a blue-staining material.

ANATOMIC DIAGNOSIS

Lobar pneumonia, right; fibrinous pleurisy; dilatation of the heart; cirrhosis of the liver; schistosomiasis, liver; cyst, colon.

TENTH CASE

Clinical history.—C. V., male, Filipino, 21 years old, born in Leyte and residing at present in Manila, was admitted to the Philippine General Hospital on May 27, 1922, pulseless and semiconscious due to profuse hæmatemesis. Companion states that patient has been in good health and that the day before admission he went to bed hungry, after heavy exercise. On the following morning and several times during the day he vomited blood. In the evening of the same day, he vomited so much blood that he collapsed.

On admission, he was very weak, collapsed, with profuse cold perspiration, pulseless, and semiconscious. The lungs and heart were apparently normal. No epigastric tenderness. In the ward his hæmatemesis was uncontrollable, and he died early on the following morning.

Clinical diagnosis.—Hæmorrhage, gastric.

The autopsy was performed four hours after death by Dr. E. W. Goodpasture.

Morbid anatomy.—Autopsy 9132. Body is that of a young Filipino male, well formed and well nourished. On removal of the sternum the lungs are found to be pale and expanded. There are firm fibrous adhesions posteriorly over the lower lobe and at the base on each side. Some congestion posteriorly. Near hilum posterior of left lung is a firm yellowish nodule (1 centimeter) lying on and attached to the pleura and embedded in a small indentation of the surface. On section through the lungs a few small scars are present in each posteriorly in lower lobes.

On opening the abdominal wall the peritoneal surfaces are found to be pale. There are numerous fibrous adhesions about the liver and colon.

The greater omentum is bound to the anterior surface of the liver above the gall bladder at one point. The cæcum is firmly attached to the retro-peritoneal tissues, and the fatty tissue about it is firm from fibrosis. There is a similar fibrosis of pericolic fat at many points, especially midway of the transverse and descending portions, where there are thickening, contraction, and scarring of the intestinal wall. Perirectal fibrosis firmly binds the rectum to the pelvis. In the omentum overlying the fundus of the stomach is an irregular, firm, light brown patch measuring 2 by 3 centimeters, involving fatty tissue, which was found later to be a mass of *Schistosoma* ova. The duodenum, jejunum, and colon are dark from bloody content, but the ileum is pale.

The œsophagus is very pale. No ulceration, inflammation, or dilated veins are noted. The stomach is of normal size. It contains a fresh blood clot forming a cast of the fundus about 10 centimeters in diameter. The entire mucosa is covered with blood. There is some post-mortem softening of the mucosa. No distinct ulceration is noted, but there are many minute erosions, in each of which is a thread of tarry blood. About 2 centimeters below the cardiac orifice are four slightly elevated areas of mucosa (0.5 centimeter) in the center of which appear to be small fresh ulcers. There is a coating of mucus over the mucosa. The duodenum and jejunum are filled with softened fresh blood clot. The blood adheres to the mucosa; when it is removed no gross ulceration is evident, but minute threads of bloody material are in the mucosa as if there had been bleeding from many small points. The remainder of the small intestine is bloodless, but the entire colon is filled with black sticky tarlike material, evidently from a previous hæmorrhage. The mucous membrane of the small intestine is otherwise normal in appearance. About 4 centimeters above the ileocæcal valve there is a patch (1 centimeter) in the serosa which is brown and dry like the area in the omentum. An *Ascaris* lies in the ileum.

Large intestine.—Two large *Trichuris* are attached to the mucosa. When the tarry content is washed away the mucosa is found to be irregularly thickened (1 or 2 millimeters) and slightly rough. The thickenings are in irregular patches and in them the mucosa is finely perforated in places, giving them a worm-eaten appearance. There are a few granular elevations of mucosa, and one or two small cystlike projections (3 to 4 millimeters) which appear to contain blood-stained material. Two of these elevations take a linear course, as if following a submucous blood vessel. The surface of these mucous thickenings has a faint brownish discoloration, and in some of them the induration involves the entire bowel wall. The appendix is normal in size, the mucosa pale and smooth except at the tip which contains a firm brown nodule.

There are a few isolated areas of thickening in the ascending colon; about midway of the transverse portion the bowel wall is indurated and constricted for a length of 3 centimeters. In this area there is an adhesion of mucous surface which divides the lumen by the formation of a small lateral channel. Here the mucosa is thickened, finely granular and delicately perforated, and the entire bowel wall is indurated. A firm nodule (2.5 by 1.5 centimeters) projects from the serous surface. A few scattered patches of thickening intervene between this portion and the mid-descending colon where there is another similar zone of induration and constriction. Below this are a few small areas of thickening until the rectum is reached, which appears normal.

Almost throughout the entire length of the colon the mesenteric fat is indurated and scarred, especially about the cæcum and the rectum.

Liver weighs 1,347 grams. It appears small and is grossly lobular from scarring. The lobules measure 4 or 5 centimeters. On opening the abdominal wall the liver was concealed by adhesion with the omentum above the gall bladder. The surface of the liver is rough and lobular, but there is no diffuse induration. Two nodules lie embedded in the capsule anteriorly over the right lobe. They measure 1 centimeter and are firm and brownish. The hepatic parenchyma is pale gray. On section there is irregular scarring which seems to be about the larger portal channels which are surrounded by a wide zone of tough silvery fibrous tissue. The spleen is greatly enlarged, weighing 565 grams. The capsule is slightly thickened. On section the cut surface is grayish purple. Trabeculæ and blood vessels are prominent. Malpighian bodies are diffuse, and on the pulp are numerous dots (1 to 2 millimeters) which are opaque, golden brown, and seem to follow the distribution of the blood vessels. About many of these is a dark red zone of hæmorrhage. There are a few small points of hæmorrhage elsewhere.

Ureters and urinary bladder appear normal.

Portal vein clot was removed from portal vein and placed in salt solution. Four specimens of *Schistosoma*, two males and two females, were found. Two others were obtained from branches of the splenic vein.

Typical ova of *Schistosoma japonicum* were found in scrapings from the cæcum and from the omentum.

ANATOMIC DIAGNOSIS

Mucous erosions of gastric mucosa; gastric and intestinal hæmorrhage; anæmia; chronic colitis (*Schistosoma japonicum*); schistosomiasis (colon, omentum, peritoneum, liver, spleen, and lungs).

The infection of schistosomiasis is of long duration. In fitting the cases reported in this paper under the classification of Houghton,⁽¹⁷⁾ we can place the first and tenth cases as terminal. The history of the second case, relative to the infection, is unknown. The third had hyperpyrexia due to typhoid. The fourth case shows a past history of occasional fevers and malaria, and died on account of ruptured appendiceal abscess. The fifth case died of ulcerative pulmonary tuberculosis; the eighth, of cerebral hæmorrhage; the ninth, of lobar pneumonia; and the tenth, of hæmatemesis.

The theory that high fever can stimulate the dissemination of the eggs is supported by the sixth case who had influenza three months before death, and since then had very severe headaches, and died with cerebral symptoms. At the autopsy a large necrotic area was found in the right temporal lobe of the brain and another, triangular in shape, in the anterior surface of the upper lobe of the left lung. The third and the seventh cases also confirm Houghton's view, for these died of typhoid fever, and some of the eggs seem to have been freshly laid in the tissues.

PATHOLOGY AND MORBID ANATOMY

The morbid anatomy depends on the presence of both the adult parasite and the ovum, and on the extent of the changes in the fixed tissue in the organs where both parasite and ova have lodged as emboli.

The penetration of the skin by the cercaria causes an intense erythema which was regarded by the Japanese workers as a skin disease and is called "kabure," while the clinical symptoms were supposed to be a special disease known as "katamaya fever." The evanescent urticarias, œdema, fever, and the cough and hæmoptysis in the early morning with areas of pulmonary dullness in the first stage of the disease⁽¹⁸⁾ point to the existence of toxin secreted by the parasite and inflammation in the lungs due to its passage through this organ on its way to the intestinal circulation.

The local necrosis of the cells in the bed of the ovum, and the cellular and fixed tissue reaction show not only that the ovum acts as a foreign body, but also that toxin is secreted by the contained miracidium. This necrosis may be circumscribed, when it can be recognized only with the help of the microscope, or it may be large enough to be detected by the naked eye. It seems that a period of time is needed for this necrosis to develop, for in cases of hyperpyrexia, which hastens the dissemination of the ova, no necrosis is recognized around the freshly laid ova. It may be that the hyperpyrexia induces in the female parasite an early discharge of the ova, which, being immature, do not contain enough toxin to produce necrosis.

The necrotic substance disappears later, either by absorption, by phagocytosis, or by breaking into a neighboring cavity or lumen with or without the help of pyogenic microorganisms, and in this way the ova are discharged.

It seems that the endothelial leucocytes are the first ones to respond; that they coalesce to form giant cells in case one or two of them cannot engulf or kill the miracidium inside the ovum; and that the fibroblasts and the eosinophilic and round-cell infiltrations come later. The histological picture is, therefore, that of chronic productive inflammation.

The adult parasite is supposed to live at least two years in the definitive host, and thus oviposition occurs not only once or twice, but many times. Each time the ova are disseminated, an inflammation takes place in the organs where they are de-

posited, and the repeated inflammation, which as we have already described is of the productive type, gives rise to fibrosis in the substance of the different organs and in their capsules, in the form of nodules, scars, and fibrous adhesions. The liver was the only internal organ that contained the ova in all of the cases and, with the exception of two cases of typhoid and peritonitis, all had eosinophilic infiltration. As an extension from the inflammation of the liver, pleural adhesions in the right cavity were present in all, except in the case of peritonitis and in the last case of typhoid. Fibrous adhesions around the appendix were present in five cases. Polypoid growths and thickening of the wall of the colon were present in the first three cases and in the last case, and in all of these ova were seen in the sections. The mesocolic and retroperitoneal lymph nodes were enlarged in the first three cases. Not only were the mesenteric lymph nodes enlarged, but they also contained ova in almost all of the cases.

Eosinophilic infiltration was found in every organ containing ova. Eosinophilic infiltration was seen without the ova, in the heart in one instance, and in the spleen in another.

In no instance did the urinary bladder, kidneys, pancreas, prostate, testes, adrenals, or stomach contain either ova or eosinophilic infiltration.

As we have seen, the later symptoms and morbid anatomy depend not only on the presence of the emboli of ova, but also on the extent of the fixed tissue reaction, which in some cases may become so uncontrollable as to give rise to tumor formations. Such a condition has been noted by Mouchet and Frouvicle⁽³⁰⁾ in a case of fibromata of the wall of the appendix, where lateral-spined ova of *Schistosoma mansoni* were found embedded in the wall. Similar ova were discovered in a case of alveolar carcinoma of the liver with metastases in the lungs. These authors believe that bilharziasis causes mechanical irritation and this, as is well known, can give rise to cancer.

Pirie⁽³²⁾ says that the common occurrence of carcinoma of the liver among South African natives can be traced to cirrhosis of the liver caused by schistosomiasis.

If the infection is not of long duration and the immediate cause of death is some intercurrent disease, whose lesions have been superimposed on the mild infection of schistosomiasis, the findings at the autopsy table are not characteristic and the presence of the ova is revealed only by the microscope.

Letulle and Nattan-Larrier,(22) in their discussion of the hepatic lesions in human schistosomiasis, say:

Schistosoma japonicum provokes marked perihepatitis and cirrhosis of the liver which is filled with ova, and the disorders caused by it are confined to the mesenteric vessels, the peritoneum, and the liver, while Egyptian bilharziasis attacks with preference the urinary tract and colon, and the lesions in the liver are very few. [Translation.]

The distribution of the ova in the different organs of this series of cases and the lesions in these organs coincide with the findings of these authors for *Schistosoma japonicum*.

The repeated finding by previous workers of ova of *Schistosoma japonicum* in stools, the absence of reported cases of either *S. hæmatobium* or *S. mansoni* from these Islands, as well as the finding of the adult worms and ova and the size of the ova found in our histological sections indicate that we are dealing with *S. japonicum*.

DISCUSSION AND PREVENTION

The high incidence in Manila shown in Table 1, is probably due to the lack of history from four of the cases in this report and because Manila, being the capital, contains more transients. The large number coming from Samar, the reports of previous workers, the yearly incidence at autopsy tables and laboratories, as well as the histories presented in this paper showing that almost all of the cases have never been out of the Islands, seem to indicate that the infection with *Schistosoma japonicum* is a menace to this country and is probably endemic.

TABLE 1.—Cases of schistosomiasis reported from the Philippine Islands.

Author.	Manila.	Samar.	Leyte.	Mindanao.	La Union.	Year.
Woolley						1906
Garrison	1	6	5	4		1906
Phalen and Nichols		1				1907
Willets	1		1		1	1908
P. Guazon	1					1918
This report	7	2	1			1912-22
Totals	10	9	7	4	1	31

Dr. Albert W. C. T. Herre, of the Bureau of Science, tells me that *Blanfordia nosophora* Robson has not yet been recorded in the Philippine Islands, although this species or members of the same genus may be found here. So far, the only successful intermediary host for *Schistosoma japonicum* is this snail; yet, Cort⁽⁵⁾ has demonstrated that other fork-tailed cercariæ from the United States have shown several examples of lack of

specificity in the choice of an intermediary host and adaptability to a new host. This fact is true of *S. hæmatobium*, for the development of cercariæ in both *Bullinus contortus* and *B. dybowskii* has been reported by Leiper(19) in Egypt, and in *Physopsis africana* by Cawson(3) in South Africa.

If the intermediary host does exist here, it can find in this country all the conditions favorable for its endemicity and spread; namely, warm climate, continuous rain, evergreen vegetation (which supplies abundant food for the snails), unsanitary methods for the disposal of human waste, the habit of our laborers compelled by necessity to wade the rice fields of going barefooted and, above all, the habit of eating partially cooked snails, which in some places are used as food, especially in time of famine.

Even if the intermediary host is not found in these Islands, the immigration of people who eat this snail and the possible entrance of infected individuals are a possible source of infection. Cort(8) found that this snail can resist drying during the shipping time from Japan to California, due to its ability to close the opening of its shell with its operculum, and that this resistance is limited to three months. Although he found that the cercaria within the snail is affected by desiccation and that the infected snails die more quickly than the uninfected, the distance from Japan to the Philippine Islands is so short that desiccation cannot be relied on to kill the snails when imported into our country.

AGE, SEX, AND OCCUPATIONAL INCIDENCE

Table 2 shows clearly that the infection is acquired at ages when the male has to work outdoors for his living.

TABLE 2.—Age, sex, and occupational incidence in schistosomiasis.

Author.	Age in years.				Sex.	Occupation.
	15-20	20-30	30-40	40+		
Woolley					M	Prisoner.
Phalen and Nichols.....		1			M	Soldier.
P. Guazon.....		1			M	Laborer.
This report.....	3	5		2	M	Prisoner and laborers.

The number of cases reported, the lowered resistance of the infected individuals, and the danger to the community must

impel us to determine the degree of infection already existing in this Archipelago, especially in Samar, by finding the adult worms or ova in the vertebrate hosts (man, cat, dog, mice, and possibly the carabao), and then to search for the intermediary host or hosts.

Should the infection be found endemic in the Philippine Islands sanitary efforts will be directed, of course, toward the hosts, both vertebrate and invertebrate, native and imported.

Leiper,⁽²⁰⁾ in investigating the etiology of bilharziasis in Egypt, hired small boys to search the pools and canals for snails and shellfishes, which were carefully examined in the laboratory in order to find the miracidium. Once this was found, Leiper was able to trace its life history outside of the human body and also the mode of infection.

To kill all the infected snails Leiper advocates the draining of pools and canals. Elgood and Thomas⁽¹⁰⁾ claim that flocks of ducks can free the canals from snails. Miyagawa⁽²⁷⁾ states that if lime containing fertilizer (Kalkstickstoff) is scattered systematically over a field and its watercourses, all the *Schistosoma* ova and intermediary hosts will be destroyed. He observed that all the ova in the stools mixed with urine and putrefying material die in two weeks in summer and in sixteen days at other seasons. On the other hand, Cort found that it is hard to kill snails by chemicals, for they escape from water in which there is no food or which has become unsuitable for them, and that draining the breeding places would be effective only if these places were kept dry at least three months.

Lutz's⁽²³⁾ observation in Brazil, although it refers to *Schistosoma mansoni*, is worth noting, for he says that the larvæ could be hatched from ova many days after they had been expelled in the fæces; that contact with water is required for the ova to hatch; and that these prefer to stay on the surface of water. He also found that *Planorbis divaceus* Spix can be infected, infection taking place by way of the antennæ, and that other flat and long snails attract larvæ through the antennæ, but that the evolution of the parasite is not complete in them. He further states that growth is checked by low temperature.

Manson⁽²⁴⁾ states that cercariæ live only forty-eight hours after being discharged from the snail, but a snail may remain infected over a long period and continue to give off cercariæ, and these can pass through the ordinary municipal filter bed

without difficulty. However, they are easily killed by most of the ordinary germicides used in water purification.

The proper disposal of waste, the prevention of ingress of cercariæ into the skin, and the appropriate treatment of the affected vertebrate host are the means of protecting the individual and of preventing him from being a source of danger to others.

The only known drug of importance in the treatment of disease caused by the other two allied members, *Schistosoma hæmatobium* and *S. mansoni*, is tartar emetic, which was first employed by McDonagh⁽²⁵⁾ and extensively used with success by Christopherson,⁽⁴⁾ and their success has been corroborated by other workers. Analogy suggests that the same treatment be followed in infections of schistosomiasis.

CONCLUSIONS

1. The ten cases of infection with *Schistosoma japonicum* reported in this paper are not an index of the extent of the existing infection in the Philippine Islands, nor are they a complete index of its frequency in our autopsies. Probably many more cases would be recognized if more-thorough histological examination were made of every corpse that comes to the morgue, as the ova were revealed only by the microscope in many cases of this series.

2. None of these cases was diagnosed ante mortem, partly due to the general belief that schistosomiasis is absent from the Islands and partly because of the clinical symptoms, which in a subtropical country can be interpreted as those of malaria, typhoid, dysentery, portal cirrhosis, etc. Another cause is the difficulty of finding the ova in the stools and, when found, to recognize them.

3. A survey of the existing degree of infection in Manila and in Samar, as well as of the presence of its intermediary host, is advisable in order to facilitate the enforcement of preventive measures.

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I am indebted to Dr. Ernest W. Goodpasture for his advice in the preparation of this paper.

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ILLUSTRATIONS

[Material for Plates 1 to 4 was taken from autopsy 2191; for Plate 5, from autopsy 9132. Plates 3 and 4 are from drawings by D. R. Matoto.]

PLATE 1

- FIG. 1. Colon, showing thickened appendices epiploicæ in schistosomiasis.
2. Surface of the liver in schistosomiasis.
3. Colon, showing polypoid growths in schistosomiasis.

PLATE 2

Cross section of the liver in schistosomiasis.

PLATE 3

- FIG. 1. Lung, showing early nodule in schistosomiasis.
2. Lung in schistosomiasis.

PLATE 4

- FIG. 1. Cross section of an adult *Schistosoma*.
2. Portal area of the liver in schistosomiasis.

PLATE 5. SCHISTOSOMA JAPONICUM

- FIG. 1. Adult female, with ova.
2. Adult male.
3. Ovum with miracidium.



PLATE 1.



PLATE 2. THE LIVER IN SCHISTOSOMIASIS, CROSS SECTION. CASE 2191.

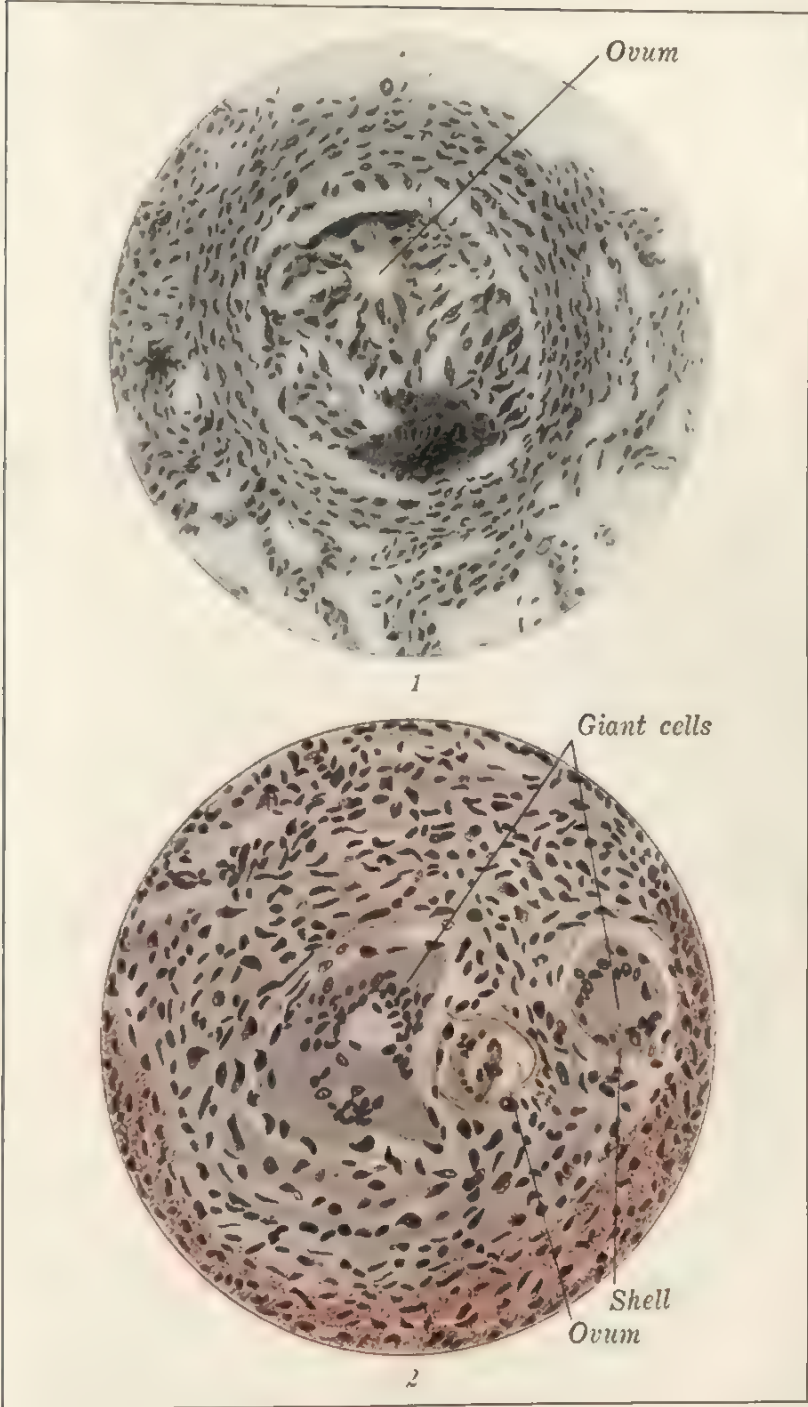


PLATE 3.

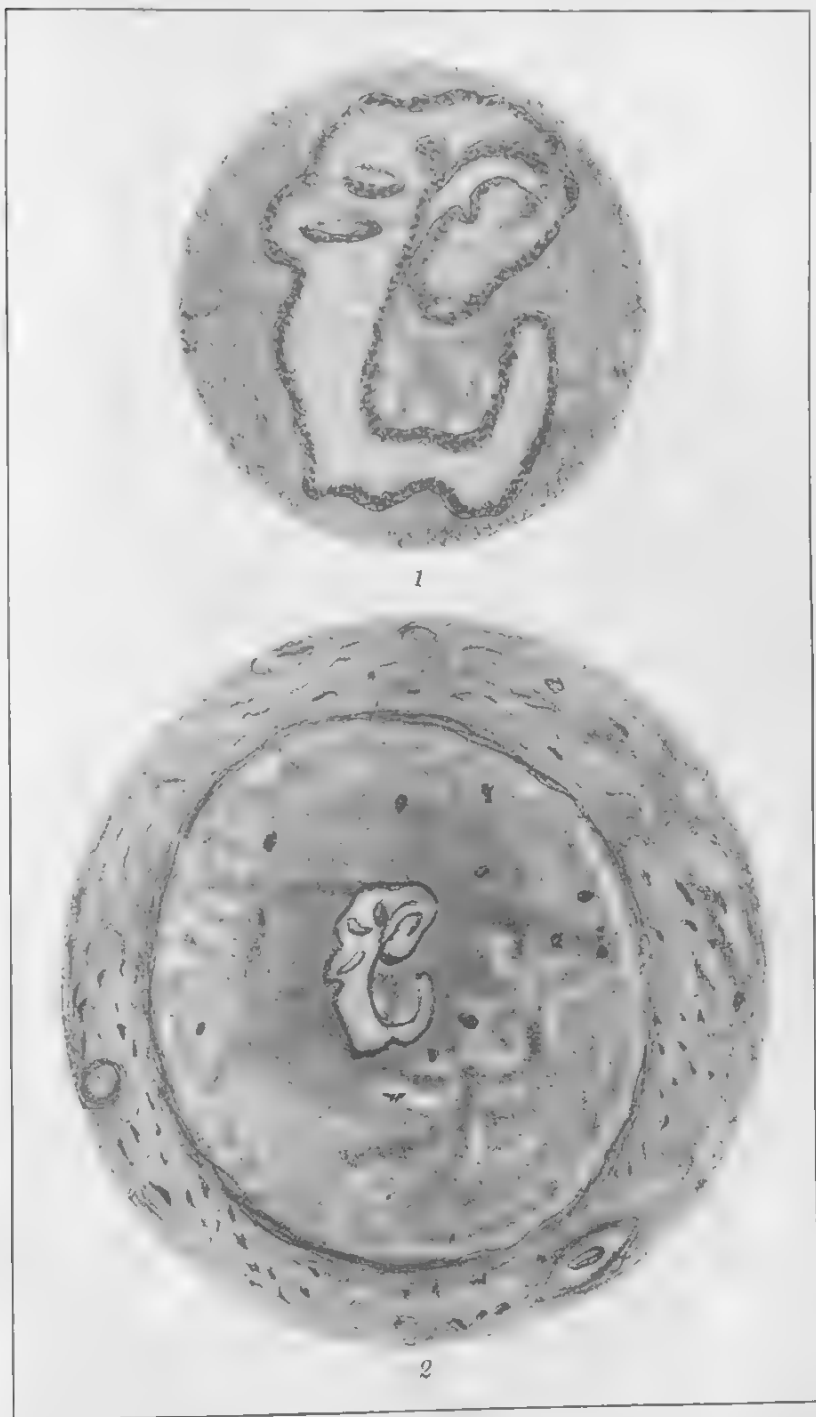


PLATE 4.

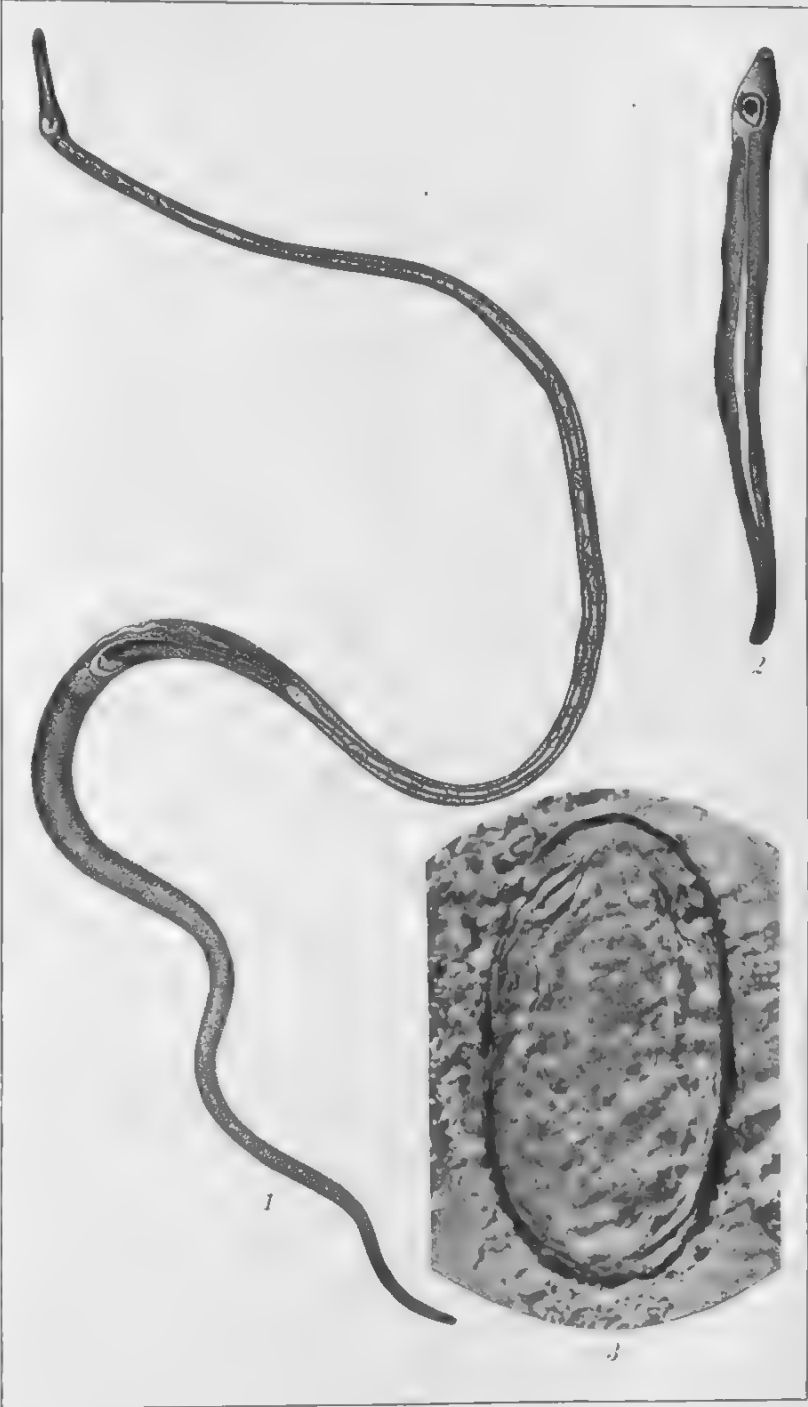


PLATE 5.

X. BEITRAG ZUR COLEOPTEREN FAUNA DER PHILIPPINEN¹

Von W. SCHULTZE

Manila, Philippinen

VIER TAFELN

Durch meinen letzten Besuch in Europa, 1921, hatte ich Gelegenheit, an der Hand des Materials verschiedener Sammlungen, besonders des Zoologischen Museums, Dresden, eine weitere Anzahl philippinischer Arten zu bestimmen und Andere als neue Arten festzustellen, die ich in Folgendem bekannt mache.

CERAMBYCIDÆ

- | | |
|---------------------------------------|---|
| <i>Aphrodisium palawanum</i> sp. nov. | <i>Doliops multifasciata</i> sp. nov. |
| <i>Euclea gloriosa</i> sp. nov. | <i>Acronia</i> ? <i>alboplagiata</i> sp. nov. |

CURCULIONIDÆ

- | | |
|---|--|
| <i>Pachyrrhynchus consobrinus</i> sp. nov. | <i>Pseudapocyrthus catanduanensis</i> sp. nov. |
| <i>Pachyrrhynchus dubiosus</i> sp. nov. | <i>Metapocyrthus</i> (<i>Artapocyrthus</i>) <i>octomaculatus</i> sp. nov. |
| <i>Pachyrrhynchus apicatus</i> sp. nov. | <i>Metapocyrthus</i> (<i>Metapocyrthus</i>) <i>lindabonus</i> sp. nov. |
| <i>Pachyrrhynchus sulphureomaculatus</i> sp. nov. | <i>Metapocyrthus</i> (<i>Metapocyrthus</i>) <i>atocanus</i> sp. nov. |
| <i>Pachyrrhynchus gloriosus</i> var. <i>abbreviatus</i> var. nov. | <i>Metapocyrthus</i> (<i>Metapocyrthus</i>) <i>sumptuosus</i> sp. nov. |
| <i>Pachyrrhynchus pulchellus</i> var. <i>modestioroides</i> var. nov. | <i>Metapocyrthus sumptuosus</i> var. <i>aureatus</i> var. nov. |
| <i>Pachyrrhynchus orbifer</i> subsp. <i>azureus</i> subsp. nov. | <i>Metapocyrthus</i> (<i>Metapocyrthus</i>) <i>interruptostriatus</i> sp. nov. |
| <i>Pachyrrhynchus halconensis</i> sp. nov. | <i>Homalocyrthus maculatus</i> sp. nov. |
| <i>Pachyrrhynchus postpubescens</i> sp. nov. | <i>Neopyrgops panayensis</i> sp. nov. |
| <i>Pachyrrhynchus regius</i> sp. nov. | <i>Alcides</i> (<i>Metallalcides</i>) <i>butuanensis</i> sp. nov. |
| <i>Pachyrrhynchus pseudoproteus</i> sp. nov. | <i>Alcides</i> (<i>Metallalcides</i>) <i>gubatanus</i> sp. nov. |
| <i>Pachyrrhynchus semiignitus</i> sp. nov. | <i>Alcides</i> (<i>Metallalcides</i>) <i>mangyanicus</i> sp. nov. |
| <i>Pseudapocyrthus apicatus</i> sp. nov. | <i>Eugithopus uhlemanni</i> sp. nov. |

Die hier beschriebenen Curculioniden gehören zum grössten Teil wiederum den Pachyrrhynchinen an. Diese Gruppe findet

¹ Der "Neunte Beitrag z. Coleopteren Fauna der Philippinen" erschien in der Deutschen Entomol. Zeitschr. (1922) 36-45, Taf. 1; alle vorhergehenden Beiträge im Philippine Journal of Science.

in den Philippinen ihre grösste Entwicklung und Verbreitung und ist durch eine ganze Anzahl für die Philippinen endemische Gattungen vertreten, deren Arten meist sehr scharf specialisiert sind, bedingt durch den Inselkarakter der Philippinen. Wiederum sind fast alle Arten in ihrem Verbreitungsgebiet sehr eng beschränkt, teilweise auf einzelne kleine Inseln, oder auf grösseren Inseln wie Luzon, auf bestimmte hohe Gebirgszüge oder selbst einzelne Berge; so dass es in den meisten Fällen leicht ist, eine Art wieder zu erkennen und zu bestimmen, wenn der genaue Fundort bekannt ist. Auch eignet sich diese Gruppe besonders von allen Coleopteren, überhaupt Insekten, durch die grosse endemische Artenzahl (ebenfalls und in gleicher Weise auch die Landmollusken) zu Rückschlüssen auf die Beziehungen der Philippinen zu anderen Inseln, wie Celebes, oder Borneo, oder noch anderen Gebieten, als einstmalige, problematische Uebergangs- oder Verbindungsbrücken, für die in Frage kommenden Urderivationsformen. Besonders erwähnen möchte ich, dass bis jetzt kein Vertreter der Pachyrrhynchinen auf der Insel Palawan oder der dieser nahe liegenden Calamianes oder Busuanga Inselgruppe gefunden wurde, trotzdem auf Palawan genügend gesammelt wurde um sich in dieser Beziehung ein Urteil zu bilden. Ich selbst sammelte auf dieser Insel verschiedene Male an vielen Plätzen, teilweise für Monate (Bacuit, Taytay, Puerto Princesa und Iwahig, Ulugan Bay, etc.). Auch Prof. Baker's Sammler sowie G. Boettcher waren auf dieser Insel tätig. Die Fauna von Palawan, in Bezug auf Expansion von Arten schliesst sich in ihren Hauptelementen an Borneo an, was auch schon Semper² und andere feststellen konnten, und in viel geringerem Maasse an die Philippinen, aus welchem Grunde man die Abwesenheit von Pachyrrhynchinen auf dieser Insel erklären könnte, da ja obige Gruppe auf Borneo sehr spärlich vertreten ist durch die Gattung *Apocyrtidius* Heller. Die Elemente der Philippinen, mit Ausnahme der Insel Palawan, besonders aber obige Gruppe, zeigen die grösste Affinität zu denen von Celebes. Um das verwandtschaftliche Verhältniss der grossen Anzahl von Arten der Gattung *Pachyrrhynchus* unter sich näher kennen zu lernen sowie das Verhältniss dieser zu anderen Pachyrrhynchinen Gattungen, habe ich Untersuchungen über die männlichen Geschlechtsorgane vorgenommen. Leider konnte ich vorläufig, mangels Materials, nur eine ausserphilippinische Art zur Untersuchung heranziehen, *Pantorhytes plutus* Oberthür. Die Resultate dieser Untersuchungen sind durch Figuren, die alle im

² Reisen im Archipel der Philippinen, II 1 Tagfalter (1886-1892) 365.

relativ gleichen Grössenverhältniss, mittelst Abbé' schen Zeichenapparats und Zeiss Binocular Mikroskop gezeichnet sind, veranschaulicht. Die Abbildungen zeigen deutlich die grossen Formenunterschiede dieser Organe bei den Gattungen *Pachyrhynchus*, *Pantorhytes*, *Metapocyrtus* Untergattung *Artapocyrtus*, *Metapocyrtus* Untergattung *Orthocyrtus*, und *Metapocyrtus* Untergattung *Homalocyrtus*, sowie der Gattungen *Pseudapocyrtus* und *Macrocyrtus*. Die grossen Unterschiede der Untergattung *Homalocyrtus* von der Gattung *Metapocyrtus* bedingt die Absonderung der Ersteren und Aufstellung als selbstständige Gattung.

Aphrodisium palawanum sp. nov. Tafel 1, Fig. 8, ♀.

Weibchen.—Kopf hell rötlich ockerfarbig, Flügeldecken hell rotbraun. Kopf, die Stirn durch eine gebogene Querfurche abgesetzt und konkav ausgehöhlt, kräftig verworren punktiert, mit einer Mittellängsfurche welche zwischen den Fühleransätzen endet. Fühler hell rötlich ockerfarbig, die letzten drei Glieder schwarzbraun. Scheitel des Kopfes sehr kräftig punktiert. Halsschild dicht und fein punktiert, nächst dem Vorder- und Hinterrande quer abgeschnürt, der mittlere Teil geschwollen, in der Mitte eine feine glatte Längslinie, die Seiten mit einem kräftigen stumpfen Dorn. Die Färbung des Halsschildes ist schwarzbraun, nur die Dornen und eine kleine Fläche je seitlich der Mitte ist rötlich ockerfarbig, die Oberseite ist äusserst fein bräunlich pubesziert. Schildchen schwarz, die Flügeldecken hell rot sehr schwach pubesziert. Unterseite schwarzblau, Mittel- und Hinterbrust fein silberglänzend pubesziert. Abdominalsegmente zerstreut punktiert, erstes und zweites Segment je seitlich am Hinterrande ebenfalls silberglänzend pubesziert. Beine rötlich ockerfarbig, mit Ausnahme der Schenkel, welche im mittleren, verdickten Teil schwarzbraun sind.

Weibchen: Länge, 36 Millimeter; Schulterbreite, 10. 6.

PALAWAN, Silanga (*M. Ramos*). Typus No. 17061, in der Sammlung des Bureau of Science, Manila.

Eulea gloriosa sp. nov. Tafel 1, Fig. 5, ♀.

Kopf und Halsschild metallisch glutrot, Flügeldecken grün und kupferig metallisch glänzend mit kremweissen Zeichnungen. Verwandt mit *E. pulchella* Schultze. Kopf, zerstreut punktiert, nach der Stirn zu feiner werdend, mit zwei divergierenden Tomentlängsstreifen, und einer schwach angedeuteten Mittelfurche. Seiten des Kopfes mit einem grossen kremweissen Tomentfleck. Fühler metallisch rot glänzend, viertes Glied, die

vordere Hälfte weiss, die hintere Hälfte sowie die folgenden Glieder schwarz tomentiert. Halsschild weitläufig zerstreut punktiert, die Punktierung nach den Seiten zu kräftiger und gröber sowie querrunzelartig zusammenlaufend. Seiten mit einer Tomentmakel am Vorder- und am Hinterrand, eine weitere Makel etwas vor den Vorderhüften. Flügeldecken im basalen Teil sehr kräftig, grob, zerstreut punktiert, nach der Mitte zu und nächst der Naht fein, nach den Seiten zu und im apikalen Drittel wieder stärker punktiert. An der Basis vor der Schulterbeule ein länglicher Tomentfleck und ein anderer nächst dem Seitenrand. Hinter dem Schildchen, von der Naht schräg nach hinten gerichtet, ein kurzer Tomentstreifen. In der Mitte der Decken zwei breitere parallele Querbänder und am Beginn des letzten Drittels ein zu den Letzteren ebenfalls paralleles aber sehr schmales Querband. Im Spitzendreieck ein Längsstreifen parallel zur Naht, ein anderer Tomentstreifen nächst dem Aussenrand und ein anderer kurzer makelartiger Streifen in der Mitte jeder Decke. Die Flügeldecken im basalen Teil und hinter der Mitte fein schwärzlich pubesziert. Unterseite, Mittelbrust je seitlich mit drei Tomentflecken, erstes Abdominalsegment am Hinterrand mit einem breiten Tomentband, welches in der Mitte unterbrochen ist. Die folgenden Segmente je seitlich kremweiss, und an den Hinterrändern unterbrochen tomentiert. Beine, die Schienen schwarz pubesziert.

Männchen: Länge, 15.5 Millimeter; Schulterbreite, 5.8. Weibchen: Länge, 18 Millimeter; Schulterbreite, 7.

MINDANAO, Surigao, Surigao (*C. F. Baker 16118*). Typus des Weibchen in meiner Sammlung; des Männchen in der Sammlung von Prof. C. F. Baker.

Doliops multifasciata sp. nov. Tafel 1, Fig. 6.

Schwarz, dunkel grünlich glänzend, Halsschild mit weissen seidenartig glänzenden Längstomentstreifen, Flügeldecken mit Tomentquerbinden. Am nächsten verwandt mit *D. geometrica* Waterhouse. Kopf mit einer feinen Dorsalmittelfurche und einem Mittellängsstreifen welcher bis zum Scheitel reicht. Seiten des Kopfes unterhalb des Auges mit einem Tomentfleck. Halsschild länger wie breit, mit einem schmalen Tomentlängsstreifen in der Mitte, einem anderen, etwas breiteren, je seitlich und einem breiten Tomentstreifen auf den Seiten vom Vorder- bis zum Hinterrand reichend. Flügeldecken im basalen Teil grob zerstreut raspelkörnig punktiert, die Punktierung wird nach der Mitte zu feiner und weitläufiger und verschwindet im apikalen Drittel. Jede Decke im basalen Drittel mit zwei

ziemlich breiten Tomentquerbinden, welche nächst der Naht und dem Seitenrande gekrümmt sind und daselbst zusammenlaufen. Zwei weitere Tomentquerbinden hinter der Mitte, die ebenfalls an der Naht und am Seitenrand zusammenlaufen. Im apikalen Drittel ein Tomentlängsstreifen welcher von der vierten Querbinde bis zum Hinterrand reicht, dann am Seitenrand kurz fortgesetzt ist, um dann in schräger Richtung mit dem Längsstreifen zusammen zu laufen und auf diese Weise eine dreieckige Figur bildet. Die Apikalenden der Flügeldecken verrundet. Unterseite, Mittel- und Hinterbrust seitlich weiss tomentiert, erstes Abdominalsegment mit breitem Tomentstreifen am Hinterrand, in der Mitte unterbrochen, die folgenden Segmente, mit Ausnahme des letzten, mit einer Tomentmakel je seitlich. Schenkel mit je zwei kleinen weisslichen Tomentflecken, an der Innen- und Aussenseite, im apikalen Teil der Verdickung. Schienen schwarz, erstes und zweites Tarsenglied hellgrau pubesziert.

Länge, 12.5 Millimeter; Schulterbreite, 4.8.

MINDANAO, Provinz Bukidnon, Lindabon (W. Schultze). Typus in meiner Sammlung.

Acronia ? *alboplagiata* sp. nov. Tafel 1, Fig. 3.

Kopf und Halsschild glänzend schwarz, Flügeldecken blauschwarz mit grünen Reflexen und hell blassgrünen Tomentmakeln. Kopf zerstreut punktiert, mit einer grossen Tomentmakel auf der Stirn, welche durch einen stark ausgeprägten Mittellängskiel geteilt wird, der Letztere als feine Furche bis zum Scheitel fortgesetzt. Ein kleiner dreieckiger Tomentfleck auf den Seiten des Kopfes unterhalb des Auges. Halsschild breiter wie lang, sehr weitläufig zerstreut punktiert, Seiten je mit zwei grossen Tomentmakeln die in der Mitte zusammenlaufen. Flügeldecken weitläufig zerstreut punktiert mit drei Tomentmakeln an der Naht; eine grosse nächst der Basis, eine längliche in der Mitte, und eine andere nächst der Apex. Jede Decke mit weiteren fünf Makeln, eine sehr grosse auf der Scheibe etwas vor der Mitte, zwei andere seitlich von dieser und am Seitenrand gelegen, sowie zwei weitere hinter der Mitte, wovon eine grosse ebenfalls am Seitenrand gelegen ist. Unterseite; Prothorax hell blassgrün tomentiert, Meso- und Metathorax mit einer grossen Tomentmakel je seitlich. Erstes Abdominalsegment mit einer dreieckigen Makel in der Mitte und einer länglichen an den Seiten, drittes Segment mit einer kleinen Makel an den Seiten, die folgenden mit grossen Makeln, das Analsegment fein pubesziert und mit einer feinen Mittellängsfurche. Mittel- und Hinterschienen schwarz pubesziert.

Länge, 22 Millimeter; Schulterbreite, 8.

MINDANAO, Provinz Bukidnon, Lindabon (W. Schultze).
Typus in meiner Sammlung.

Diese Art ist nahe verwandt mit *A. decimaculata* Schultze.³

Pachyrrhynchus consobrinus sp. nov. Tafel 2, Fig. 5, ♂.

Glänzend schwarz, Flügeldecken mit matten, farblosen Schuppenmakeln. Rüssel, in der Apikalhälfte fein zerstreut punktiert, Basalhälfte mit einem kräftig ausgeprägten dreieckigen Dorsaleindruck. Halsschild länger wie breit, glänzend schwarz, sehr fein zerstreut punktiert, eine kleine rundliche Schuppenmakel je seitlich der Mitte am Vorderrand, sowie eine andere, etwas hinter der Längsmittle und eine grosse Makel auf den Seiten über den Vorderhüften. Flügeldecken beim Männchen sehr länglich oval; beim Weibchen gedrunken oval, grösste Breite vor der Mitte, glänzend schwarz, mit einer scharf ausgeprägten abgekürzten Punktreihe in der hinteren Hälfte jeder Decke nächst dem Aussenrande, welche furchenartig nächst der Apex endet. Jede Decke mit zwei grossen rundlichen Schuppenmakeln an der Basis, drei weiteren eine Querreihe bildenden Makeln vor der Mitte, vier Makeln ebenfalls eine Querreihe bildend im apikalen Drittel, eine Makel im apikalen Dreieck, sowie eine kleine beiden Decken gemeinsame Nahtmakel hinter der Mitte und eine grosse Nahtmakel an der Apex. Die Beschuppung der Makeln ist graulich oder nahezu farblos, ähnlich wie bei *P. tristis* Heller.

Männchen: Länge, 17.6 Millimeter (ohne Rüssel); Breite, 6.3.
Weibchen: Länge, 19 Millimeter (ohne Rüssel); Breite, 7.6.

LUZON, Bontoc (W. Schultze). Typus Männchen und Weibchen in meiner Sammlung.

Diese Art gehört in die Verwandtschaft von *P. pinorum* Pascoe und steht der *P. tristis* Heller am nächsten, von der mir Exemplare aus Luzon, Provinz Benguet, vorliegen und von welcher ich die Typen untersuchte. *Pachyrrhynchus consobrinus* unterscheidet sich von *P. tristis* Heller besonders durch die äusserst glatten, polierten Flügeldecken die keinerlei Runzelung oder Andeutung von Längsfurchen, wie bei letzterer Art, zeigen. Auch sind die Schuppenmakeln viel grösser als bei obiger Art.

Pachyrrhynchus dubiosus sp. nov. Tafel 3, Fig. 4.

Schwarz, Flügeldecken mit breiten unregelmässigen Längsfurchen die sehr spärlich mit kleinen nahezu farblosen Schupp-

³ Philip. Journ. Sci. 15 (1919) 548, Taf. 1, Fig. 17.

chen besetzt sind. In die nähere Verwandtschaft von *P. pinorum* Pascoe und *P. lacunosus* Heller gehörig. Rüssel in der Apikalhälfte zerstreut punktiert, Basalhälfte mit kräftig ausgeprägtem Dorsaleindruck und Mittellängsfurche. Halsschild länger wie breit, fein zerstreut punktiert. Flügeldecken lederartig gerunzelt. Die längsfurchenartigen Eindrücke auf dem Grunde schwach gekielt. Die Zwischenräume zwischen den Eindrücken wulstig erhaben. Unterseite und Schenkel unbeschuppt.

Männchen: Länge, 18 Millimeter (ohne Rüssel); Breite, 7.
Weibchen: Länge, 21 Millimeter (ohne Rüssel); Breite, 8.5.

LUZON, Provinz Benguet, Berg Santo Tomás und Haight's Place (W. Schultze). Typen in meiner Sammlung.

Diese Art steht in systematischer Beziehung in der Mitte zwischen *P. pinorum* Pascoe und *P. lacunosus* Heller.

Pachyrhynchus apicatus sp. nov. Tafel 3, Fig. 1.

Schwarz glänzend, Kopf, Halsschild und Flügeldecken mit grossen grünlichgelben Schuppenmakeln. Verwandt mit *P. venustus* Waterhouse. Rüssel in der Apikalhälfte fein zerstreut punktiert, Basalhälfte mit einem etwas flachen dreieckigen Eindruck mit einer Mittellängsfurche. Ein weiterer schwacher Eindruck auf der Stirn, mit einer grossen Schuppenmakel, Seiten des Kopfes unter dem Auge ebenfalls. Halsschild länger wie breit, fein und gleichmässig zerstreut punktiert, je seitlich der Mitte mit einer grossen länglichen Schuppenmakel und einer Makel an den Seiten über den Vorderhüften. Flügeldecken länglich eiförmig, fein lederartig gerunzelt. Die Decken an der Apex in eine kurze schnabelartige Spitze auslaufend, ausgeprägt beim Weibchen, beim Männchen verrundet. Jede Decke mit zehn Schuppenmakeln; zwei grössere an der Basis; drei bilden eine Querreihe vor der Mitte, von welchen die am Seitenrand gelegene am grössten und nach hinten gerichtet ist; zwei im apikalen Drittel; eine dreieckige Makel nächst der Apex; sowie zwei Suturalmakeln, eine in der Mitte und die andere im apikalen Viertel. Unterseite der Vorder-, Mittel-, und Hinterbrust ebenfalls grünlichgelb beschuppt. Erstes und zweites Abdominalsternit je seitlich mit einer grossen Schuppenmakel. Schenkel mit einer Schuppenmakel unterseits nächst den Kniegelenken und einem kleinen Schuppchenschwamm oberseits.

Männchen: Länge, 17.6 Millimeter (ohne Rüssel); Breite, 7.
Weibchen: Länge, 19 Millimeter (ohne Rüssel); Breite, 8.

POLILLO (W. Schultze). Typen in meiner Sammlung.

Pachyrrhynchus sulphureomaculatus sp. nov. Tafel 2, Fig. 1, ♀.

Glänzend schwarz, mit schwefelgelben Schuppenmakeln. Rüssel in der Apikalhälfte schwach zerstreut punktiert, in der Mitte querstufig verrundet abgesetzt, die Basalhälfte mit Mittellängsfurche und nach den Seiten zu abgeschrägtem Dorsaleindruck, welcher auf der Stirn verläuft. Stirn mit einem runden Schuppenfleck. Halsschild so breit wie lang, je seitlich in der Mitte mit einer ovalen Schuppenmakel, sowie auf den Seiten eine grosse Längsschuppenmakel über den Vorderhöften. Flügeldecken kurz gedrunken oval, ganz glatt; ohne Spuren von Punktreihen. Jede Decke mit dreizehn rundlichen und ovalen Schuppenmakeln; drei Makeln nächst der Basis, drei weitere ebenfalls eine Querreihe bildend etwas vor der Mitte von welchen die nächst dem Seitenrand gelegene sehr gross und lang gestreckt ist; eine weitere grosse längliche Seitenrandmakel etwas hinter der Mitte, vier Makeln im apikalen Drittel und eine kleine Nahtmakel etwas hinter der Deckenmitte sowie eine andere Nahtmakel im apikalen Viertel. Beine ebenfalls schwarz, Schenkel mit einer länglichen scharf ausgeprägten Schuppenmakel auf der Unterseite, nächst den Kniegelenken.

Weibchen: Länge, 15.5 Millimeter (ohne Rüssel); Breite, 7.

MINDANAO, Provinz Cotabato, Cotabato (C. M. Weber). Typus in meiner Sammlung.

Diese Art hat die Flügeldecken sehr gedrunken, kurz oval, in Form ähnlich wie *P. ardentius* Schultze.

Pachyrrhynchus gloriosus Faust var. *abbreviatus* var. nov.

Die Längsstreifen des Halsschildes, je seitlich der Mitte am Hinterrand, sind breit makelartig reduziert, der Schuppenstreifen über den Vorderhöften breiter als bei der Stammform. Flügeldecken; die Längs- und Querstreifen sind fragmentär als relativ breite Längs- oder Querschuppenmakeln vorhanden, nur der breitere Seitenrandstreifen ist vollständig, der erste Schuppenlängsstreifen im apikalen Drittel erhalten.

Männchen: Länge, 14 Millimeter (ohne Rüssel); Breite, 6.

LUZON, Provinz Bontoc.

Pachyrrhynchus pulchellus Behr. var. *modestioroides* var. nov.

Dunkel kupferrot glänzend. Halsschild wie bei der Stammform gezeichnet. Flügeldecken mit je nur drei breiten, blassgrünen Längsschuppenstreifen, dem *P. inchythus* Pascoe dadurch sehr ähnlich.

Männchen: Länge, 13 Millimeter (ohne Rüssel); Breite, 5.

LUZON, Provinz Benguet, Berg Polis (W. Schultze).

Da ich Gelegenheit hatte die von Heller beschriebene *P. bakeri* * zu untersuchen, konnte ich feststellen dass dieses Stück nur als eine der vielen Formen von *P. pulchellus* Behrens, und als var. *bakeri* dieser Art, anzusehen ist.

Pachyrrhynchus inclytus Pascoe.

Pachyrrhynchus inclytus PASCOE, Journ. Linn. Soc. London 11 (1873) 155.

Bei der genauen Durcharbeitung meines grossen Materials von *P. modestior* Behrens kam ich zur Ueberzeugung dass letztere Art identisch mit *P. inclytus* Pascoe ist. Auch diese Art tritt in verschiedenen Lokalformen auf und ist *P. modestior* Behrens als *P. inclytus* var. *modestior* zu stellen, ebenfalls var. *transversatus* Heller welche wiederum als eine Combination der von Behrens ⁵ erwähnten var. β Behr. und var. γ Behr. anzusehen ist.

Pachyrrhynchus orbifer subsp. *azureus* subsp. nov. Tafel 2, Fig. 8, ♂.

Schwarz, Halsschild und Flügeldecken mit lapizlazuli blauen Schuppenbändern. Kopf, Stirn mit länglichem Schuppenstreifen und Seiten des Kopfes mit einer Schuppenmakel. Halsschild mit einem Querband etwas vor der Mitte, welches sich auf den Seiten makelartig erweitert und einem keilförmigen Mittellängsstreifen welcher von dem Querstreifen bis zum Hinterrand reicht. Flügeldecken undeutlich gereiht-punktiert, mit einer grossen querbandartigen Makel an der Basis, einem Querband in der Mitte und einer grossen Makel im apikalen Drittel welche sich längs des Seitenrandes mit dem mittleren Querband verbindet. Schenkel mit einer Ringmakel nächst den Kniegelenken und einer kleinen länglichen Makel vor der Mitte.

Männchen: Länge, 12 Millimeter (ohne Rüssel); Breite, 5.6. LUZON, Provinz Benguet, Kabayan (W. Schultze).

Pachyrrhynchus halconensis sp. nov. Tafel 2, Fig. 3, ♀.

Glänzend schwarz mit metallisch blassgrünlichen (Männchen) oder kupferig schimmernden (Weibchen) Schuppenzeichnungen; in die Verwandtschaft von *P. phaleratus* Waterhouse gehörig. Rüssel nach der Apex zu stark divergierend, in der Apikalhälfte zerstreut punktiert, die Basalhälfte mit einem kräftig ausgeprägten dreieckigen Eindruck mit Schuppenmakel, die Seitenränder schwielig hervortretend. Der Eindruck verläuft auf der Stirn.

* Philip. Journ. Sci. 19 (1921) 542.

⁵ Stett. Ent. Zeitg. 48 (1887) 241.

Die Letztere ebenfalls mit einer dreieckigen Schuppenmakel. Halsschild etwas breiter wie lang, sehr fein zerstreut punktiert, mit einem Schuppenquerstreifen vor der Mitte, welcher je seitlich nach dem Vorder- und Hinterrande abzweigt und eine grosse Kahlmakel auf den Seiten umschreibt. In der Mitte am Hinterrande eine längliche keilförmige Makel welche vor dem Querstreifen endet. Flügeldecken beim Männchen länglich oval, beim Weibchen gedrunken oval, sehr schwach angedeutet, weitläufig gereiht-punktiert. Die Decken mit einer unregelmässigen Querbinde in der Mitte, in der Basalhälfte im dorsalen Teil ein Schuppenlängsstreifen welcher sich nach der Basis zu erweitert und als breiter Seitenrandstreifen bis zur Apex fortsetzt um an dieser Stelle sich makelartig zu erweitern, besonders beim Weibchen und sich mit einem makelartigen Längsstreifen, welcher bis zur Querbinde reicht, zu verbinden. Beim Weibchen findet sich noch ein Nahtstreifen in der hinteren Deckenhälfte welcher in seinem Verlauf unterbrochen ist und nächst der Apex eine Nahtmakel bildet. Unterseite, Mittel- und Hinterbrust sowie erstes Abdominalsegment mit einer Schuppenmakel je seitlich. Schenkel mit einer oberseits unterbrochenen breiten Schuppenringmakel nächst den Kniegelenken.

Männchen: Länge 13.6 Millimeter (ohne Rüssel); Breite, 6.
Weibchen: Länge, 17 millimeter (ohne Rüssel); Breite, 7.8.

MINDORO, Vorberge des Berges Halcon (*M. Ramos*). Typen in meiner Sammlung.

Diese Art scheint in Bezug auf Zeichnung ziemlich zu variieren. Die Längsschuppenstreifen im dorsalen Teil der Decken erreichen beim Männchen die Querbinde nicht, auch ist bei diesem der Nahtstreifen in der hinteren Deckenhälfte nicht vorhanden. Von *P. phaleratus* Waterhouse welche auf die Catanduanes Insel beschränkt ist unterscheidet sich diese Art leicht durch die anders geformten Flügeldecken.

Pachyrrhynchus postpubescens sp. nov.

Dunkel kupferig rot glänzend, Halsschild mit blassgrünen Längsschuppenstreifen, Flügeldecken mit Schuppenbändern die in ihrer Anlage und Form mit denen von *P. speciosus* Waterhouse nahezu übereinstimmen. Rüssel in der Basalhälfte mit kräftig ausgeprägtem Dorsaleindruck, dessen Seiten wulstig hervortreten. Stirn mit einer ovalen Längsschuppenmakel mit einem Kahlstrich in der Mitte, Seiten des Kopfes mit einer Schuppenmakel unter dem Auge. Halsschild kaum so breit wie lang, die grösste Breite hinter der Mitte, mit zwei Dorsallängs-

streifen die nach dem Vorderrande zu schwach divergieren. Jede Seite mit zwei weiteren Längsstreifen die am Vorder- und Hinterrand verbunden sind. Flügeldecken kräftig gereiht-punktiert. Jede Decke im basalen Drittel mit einem Schuppenband welches in Form eines quergestellten länglichen Ovals von der ersten Punktreihe bis zum Seitenrand reicht. Im mittleren Drittel zwei beide Decken kreuzende Querbänder welche auf den Seiten nach hinten umbiegen und im apikalen Drittel eine dreieckige Längsfigur umschreiben. Die Decken im apikalen Drittel kurz behaart. Unterseite der Vorder-, Mittel- und Hinterbrust zerstreut beschuppt, ebenfalls erstes und zweites Abdominalsternit. Schenkel mit einer Schuppenmakel unterseits nächst den Kniegelenken.

Männchen: Länge, 13 Millimeter (ohne Rüssel); Breite, 6: Weibchen: Länge, 14.5 Millimeter (ohne Rüssel); Breite, 6.6.

MINDANAO, Provinz Bukidnon, Lindabon (W. Schultze). Typen in meiner Sammlung.

Pachyrhynchus regius sp. nov. Tafel 2, Fig. 6, ♀.

Dunkel glutrot glänzend, Flügeldecken mit grossen rundlichen gelblich grünen Schuppenringmakeln. In die Verwandtschaft von *P. speciosus* Waterhouse gehörig. Rüssel in der Apikalhälfte fein zerstreut punktiert, in der Mitte quer stufig abgesetzt, Basalhälfte mit kräftig ausgeprägtem bis zur Stirn reichendem Dorsaleindruck mit einer feinen Längsfurche in der Mitte. Der Eindruck auf der Stirn mit einer länglichen Schuppenmakel. Die Seitenkanten des Rüssels, nächst dem Dorsaleindruck wulstig hervortretend. Seiten des Rüssels unter der Fühlerfurche mit einem Fleck feiner gelblich grüner Härchen, Seiten des Kopfes unter dem Auge mit einer länglichen Schuppenmakel. Halsschild so lang wie breit, die Seiten schwach gerundet. Die Zeichnungsanlage sehr ähnlich der von *P. speciosus* Waterhouse jedoch breiter. In der Mitte, vom Hinterrand bis nahe zum Vorderrand reichend, zwei nach vorn wenig divergierende, dann zu einer Spitze sich vereinigende, Längsschuppenstreifen, die eine lanzett- oder pfeilförmige Figur bilden. Zwei breite Längsschuppenstreifen auf jeder Seite des Halsschildes, welche am Vorder- und Hinterrand verbunden sind und auf jeder Seite eine ungefähr länglich ovale Figur umschreiben. Flügeldecken länglicher in Form als *P. speciosus* Waterhouse, gereiht-punktiert. Jede Decke mit einer sehr grossen rundlichen Schuppenringmakel an der Basis, von der ersten Punktreihe bis zum

Seitenrand reichend. In der Mitte jeder Decke eine Querreihe von zwei etwas kleineren Ringmakeln und im Apikaldreieck eine grössere Ringmamel. Die in der Mitte am Seitenrand gelegene Ringmamel ist der im Apikaldreieck gelegenen, durch einen breiten Schuppenstreifen am Seitenrand, verbunden. Die beschuppten Stellen des Halsschildes und der Flügeldecken sind mehr oder weniger eingepresst oder vertieft. Unterseite, Vorder-, Mittel-, und Hinterbrust mehr oder weniger zerstreut beschuppt, erstes und zweites Abdominalsternit mit einer Schuppenmamel je seitlich. Schenkel mit einer kleinen Schuppenmamel unterseits nächst den Kniegelenken.

Männchen: Länge, 12.3 Millimeter (ohne Rüssel); Breite, 5.5.

Weibchen: Länge, 13 Millimeter (ohne Rüssel); Breite, 6.

LEYTE, von den Bergen in der Nähe des Dorfes Cabalian, im südlichsten Teil der Insel. Typen in meiner Sammlung.

Drei Exemplare dieser schönen Art erhielt ich durch die Güte des Herrn Dr. Albert W. C. T. Herre.

Pachyrhynchus pseudoproteus sp. nov. Tafel 2, Fig. 2, ♂.

Kopf, Halsschild, und Beine glänzend schwarz, Flügeldecken matt, fein lederartig gerunzelt, mit blassgrünlichen Schuppenmakeln. Kopf, Rüssel in der Apikalhälfte zerstreut punktiert, Basalhälfte mit kräftigem Dorsaleindruck, die Seitenränder wulstig hervortretend, Stirn mit einer länglich ovalen Schuppenmamel, Seiten des Kopfes mit einer Längsschuppenmamel. Halsschild so lang wie breit, glänzend schwarz, glatt, mit einer kräftig ausgeprägten Furche nächst dem Hinterrande. In der Mitte auf der Scheibe zwei kleine keilförmige quergestellte Schuppenmakeln, Seiten mit je zwei ungefähr wellenförmigen Längsschuppenstreifen welche am Hinterrande zusammenlaufen. Flügeldecken gedrunken oval, schwach ausgeprägt gefurcht gereiht-punktiert, die Zwischenräume schwach gewölbt. Jede Decke mit drei Schuppenmakeln an der Basis, von welchen eine im dorsalen Teil und die am Seitenrand gelegene am grössten sind; in der Mitte eine querbandartige Doppelreihe von sechs grösseren Makeln, zwischen welchen sich einige kleine Schuppenpunkte befinden, sowie eine lange Randmamel; im apikalen Drittel drei querbandartig zusammenlaufende Makeln und ein Schuppenstreifen welcher das Spitzendreieck umschreibt. Unterseite, Mittel- und Hinterbrust sowie erstes Abdominalsegment mit einer Schuppenmamel je seitlich. Schenkel mit grosser Schuppenmamel nächst den Kniegelenken.

Männchen: Länge, 10.8 Millimeter (ohne Rüssel); Breite, 5.

LUZON, Provinz Laguna (A. Worm). Typus in meiner Sammlung.

Diese Art gehört in die Verwandtschaft von *P. multipunctatus* Waterhouse welche auf die Insel Bohol beschränkt zu sein scheint. Oberflächlich erinnert *P. pseudoproteus* etwas an *Metapocyrtus proteus* Heller.

Pachyrrhynchus semiignitus sp. nov. Tafel 2, Fig. 9, ♂.

Kopf und Halsschild glänzend glutrot, Flügeldecken und Beine metallisch kupferig glänzend. Decken mit blassgrünen Schuppenmakeln und Streifen. Rüssel in der Apikalhälfte kräftig zerstreut punktiert, Basalhälfte mit stark ausgeprägtem Dorsaleindruck, einen kleinen Schuppenschwarm tragend. Die Seitenränder des Eindruckes wulstig aufgeworfen. Halsschild etwas breiter wie lang, die Seiten mässig gerundet. Eine feine Schuppenlinie am Vorder- sowie am Hinterrande, auf den Seiten, über den Vorderhüften durch einen makelartig erweiterten Längsstreifen verbunden. Flügeldecken gereiht-punktiert; jede Decke im basalen Drittel mit einer Querreihe von vier grösseren länglichen Schuppenmakeln, zwischen denen einige kleine Schuppenpunkte stehen; im apikalen Drittel, zwischen der zweiten und dritten Punktreihe ein Längsschuppenstreifen welcher sich nächst der Apex mit einem kurzen Seitenrandstreifen verbindet, auf diese Art eine V-förmige oder dreieckige Figur bildend. Innerhalb dieses Dreieckes, zwei eine Querreihe bildende, kleine Schuppenmakeln. Unterseite kupferig glänzend, Mittelbrust zerstreut beschuppt und mit einer grossen Makel je seitlich, ebenfalls die Hinterbrust. Schenkel mit einem kleinen Schuppenschwarm auf der Unterseite nächst den Kniegelenken.

Männchen: Länge, 11.5 Millimeter (ohne Rüssel); Breite, 5.6.

MINDANAO, Provinz Cotabato, Pikit. Typus in meiner Sammlung.

Pseudapocyrtus apicatus sp. nov. Tafel 1, Fig. 7, ♀.

Kopf, Halsschild, und Beine schwarz, Flügeldecken kastanienbraun mit kremfarbigen Schuppenflecken. In Körperform dem *P. imitator* Heller* am ähnlichsten. Rüssel schwach gewölbt, dicht punktiert, an der Basis durch eine gebogene Querfurche von der Stirn abgesetzt. Letztere zerstreut punktiert, mit einer Mittellängsfurche und einem Schuppenfleck. Halsschild länger wie breit, kräftig quengerunzelt mit einer undeutlichen Mittellängsfurche. Je seitlich der Mitte ein nicht sehr

* Philip. Journ. Sci. § D 7 (1912) 329, Taf. 2, Fig. 2.

dicht beschuppter Längsstreifen vom Vorder- bis zum Hinterrand reichend. Ein anderer breiterer Schuppenstreifen auf den Seiten über den Vorderhüften. Flügeldecken schwach glänzend unregelmässig gereiht-punktiert. Jede Decke mit sieben grösseren Schuppenflecken, einer an der Basis, fünf im mittleren Teil der Decke wovon zwei am Aussenrand liegen, und ein grosser dreieckiger Schuppenfleck an der apikalen Verjüngung der Decke. Der Seitenrand an der Apex mit einem kleinen rundlichen Ausschnitt, die Nahtenden in eine gemeinsame, nach unten gebogene, schnabelartige Spitze auslaufend. Unterseite, Mittel- und Hinterbrust je seitlich mit einem Schuppenfleck. Letztes Abdominalsegment mit einem gebogenen Ausschnitt. Hinterschenkel die Deckenspitze nicht überragend.

Weibchen: Länge, 10.5 Millimeter (ohne Rüssel); Breite, 4.5.

LUZON, Provinz Bontoc (W. Schultze). Typus in meiner Sammlung.

Pseudapocryptus catanduanensis sp. nov. Tafel 2, Fig. 7, ♀.

Schwarz; Fühlerschaft, Halsschildoberseite, und Beine rot mit Ausnahme der Schenkelspitzen und Tarsenglieder welche ebenfalls schwarz sind. Nahe verwandt mit *P. formicarius* Heller. Rüssel zerstreut punktiert, der Länge nach schwach gewölbt, mit einer kräftigen Mittellängsfurche welche vor der Stirn in einem punktförmigen Eindruck endet. Halsschild kugelig, so lang wie breit, mit einer Vorder- und Hinterrandfurche; der von letzteren abgeschnürte, etwas gewulstete Vorder- und Hinterrand schwarz; Oberseite rot, abgeschliffen gekörnelt, und mit kräftiger Mittellängsfurche. Halsschild relativ kleiner als bei *P. formicarius* Heller. Flügeldecken beim Männchen $1\frac{1}{2}$ mal so lang wie breit, kräftig gewölbt, kurz eiförmig, im apikalen Drittel nach der Apex zu verjüngt und verrundet; beim Weibchen $1\frac{1}{2}$ mal so lang wie breit, für zwei Drittel der Länge kräftig gewölbt, dann plötzlich seitlich scharf abgeschnürt, der apikale Teil der Decken seitlich zusammengedrückt einen nasenähnlichen Vorsprung bildend. Apex an der Naht mit dreieckigem Ausschnitt, am Seitenrand mit schwach gebogenem Ausschnitt, so dass die Deckenspitzen von der Seite gesehen eine scharf gebogene, schnabelartige Form haben. Die Decken sehr grob, tief und regelmässig gereiht-punktiert, etwas gröber als bei obiger Art. Hinterschenkel beim Weibchen die Deckenspitzen nicht, beim Männchen weit überragend.

Männchen: Länge, 10 Millimeter (ohne Rüssel); Breite, 4.5.

Weibchen: Länge, 11 Millimeter (ohne Rüssel); Breite, 5.

CATANDUANES, Virac (W. Schultze). Typen in meiner Sammlung.

Diese Art unterscheidet sich besonders beim Weibchen von *P. formicarius* Heller dadurch dass der apikale Teil der Flügeldecken bei letzterer Art breiter, seitlich nicht so stark abgeschnürt und zusammengedrückt ist. *P. formicarius* Heller die mir nur von der Insel Polillo vorliegt ist nach einem männlichen Exemplar beschrieben.

Die Gattungen *Pseudapocyrtus* Heller und *Apocyrtus* Erichson sind sehr nahe mit einander verwandt, wie auch die Penisformen von *P. catanduanensis* sp. nov. (Tafel 4, Fig. 12) und *P. formicarius* Heller⁷ (Tafel 4, Fig. 13) sowie *A. inflatus* Erichson (Tafel 4, Fig. 14) zeigen.

Metapocyrtus (*Artapocyrtus*) *octomaculatus* sp. nov. Tafel 1, Fig. 10, ♂.

Glänzend schwarz, jede Flügeldecke mit vier blass rosafarbenen Schuppenflecken (Männchen). Nahe verwandt mit *A. sexmaculatus* Schultze und *quadriplagiatus* Roelofs, der letzteren Art am nächsten stehend. Rüssel gewölbt, an der Basis durch eine breite Quersfurche scharf abgesetzt und mit einer Mittellängsfurche welche bis zur Stirn reicht. Rüsselunterseite mit kräftigerem, nach hinten gerichtetem Zapfen als *A. quadriplagiatus* Roelofs. Halsschild so lang wie breit, zerstreut punktiert, mit einem Schuppenstreifen am Vorder- und am Hinterrand, beide an den Seiten durch einen Schuppenstreifen verbunden. Flügeldecken kräftig unregelmässig gereiht-punktiert, nicht so dicht als bei letztgenannter Art. Jede Decke im basalen Drittel mit zwei eine Querreihe bildenden Schuppenmakeln und zwei weiteren Makeln am apikalen Drittel.

Männchen: Länge, 11 Millimeter (ohne Rüssel); Breite, 4.7. POLILLO (W. Schultze). Typus in meiner Sammlung.

Diese Art scheint auf obigen Fundort beschränkt zu sein.

Artapocyrtus quadriplagiatus Roelofs erhielt ich von Luzon, Provinz Laguna, Umgebung vom Dorf Paete, und *A. sexmaculatus* Schultze nur von Virac auf den Catanduanes Inseln. Auf Grund langjähriger Beobachtungen möchte ich bemerken dass alle Arten der philippinischen Pachyrrhynchiden in ihrem Verbreitungsgebiet sehr beschränkt sind; fast alle Arten treten äusserst lokal auf. Zu obiger Untergattung *Artapocyrtus* gehören ausser den von Heller⁸ angeführten Arten noch die folgen-

⁷ Philip. Journ. Sci. § D 7 (1912) 327, Taf. 2, Fig. 1.

⁸ Philip. Journ. Sci. § D 7 (1912) 338.

den: *A. panayensis* Schultze, von der Insel Panay; *A. bucasanus* Schultze von der Insel Bucas Grande; und *A. violaceus* Schultze von der Insel Siargao. Letztere Art hält Prof. Heller⁹ für identisch mit der alten von Cuming¹⁰ gesammelten Art *A. bifasciatus* Waterhouse.¹¹ Aus der Baker'schen Sammlung erhielt ich von Heller bestimmte Exemplare von *A. bifasciatus* Waterhouse welche aus Mindanao, Provinz Agusan, Butuan, stammen und welche ich auch der Beschreibung nach als diese Art bestimmte. Diese Art unterscheidet sich durch die viel schwächer ausgeprägte Skulptur des Halsschildes und Punktierung der Flügeldecken, sowie der blassgrünen oder goldiggrünen Beschuppung der Querbinden, sehr deutlich von *A. violaceus* Schultze, bei welcher Art die Binden violettbläulich beschuppt sind und welche auf die Insel Siargao beschränkt ist.

Metapocyrtus (*Metapocyrtus*) *lindabonus* sp. nov. Tafel 1, Fig. 12, ♂.

Schwarz glänzend, Halsschild mit grossen ovalen bläulichgrünen Längsschuppenmakeln, Flügeldecken mit breiten Schuppenquerbändern. Rüssel dicht verworren punktiert, an der Basis durch eine Querfurche abgesetzt und mit einer Mittellängsfurche welche bis zur Stirn reicht. Rüssel mit einigen zerstreuten Schuppen, Stirn mit kleinem, makelartigen Schuppenwarm. Halsschild so lang wie breit, undeutlich zerstreut punktiert und fein gerunzelt, am Vorderrand ein schmaler Schuppenstreifen welcher mit einer grossen Schuppenmakel auf den Seiten, über den Vorderhüften, zusammenläuft. Je seitlich der Mitte eine grosse ovale Längsschuppenmakel. Flügeldecken beim Männchen länglich oval, beim Weibchen gedrunken oval, die grösste Breite etwas vor der Mitte, weitläufig zerstreut, ziemlich grob punktiert. Jede Decke mit drei querbandartigen bläulichgrün metallischen Schuppenflächen welche durch einen Kahlstreifen längs der Naht und durch zwei schmale Kahlquerbänder von einander getrennt sind. Beim Weibchen ist das Schuppenquerband der Basis schmaler als beim Männchen und gleichbreit wie der erste Querkahlstreifen, das mittlere Querband hat beim Weibchen im dorsalen Teil der Decke eine Makel abgeteilt, ebenfalls ist die beschuppte Fläche in der Apikalhälfte der Decke bei Letzterem teilweise in Makeln aufgelöst.

⁹ Entomolog. Mitteil. 10 (1921) 197.

¹⁰ Cuming sammelte auf der Hauptinsel Mindanao speziell in der Provinz Misamis. Siehe ebenfalls Philip. Journ. Sci. § C 10 (1915) 183.

¹¹ Ann. & Mag. Nat. Hist. 7 (1841) 226, 9 (1842) 307.

Unterseite, Mittelbrust je seitlich, mit einer Schuppenmakel. Beine schwarz, fein greis behaart.

Männchen: Länge, 13 Millimeter (ohne Rüssel); Breite, 5. Weibchen: Länge, 13.5 Millimeter (ohne Rüssel); Breite, 6.

MINDANAO, Provinz Bukidnon, Lindabon (W. Schultze). Typen in meiner Sammlung.

Metapocyrtus (Metapocyrtus) atocanus sp. nov. Tafel 1, Fig. 9, ♂.

Schwarz, Flügeldecken mit gleichbreiten schwarzen und metallisch grünen Schuppenlängsstreifen. Rüssel dicht und gleichmässig verworren punktiert, mit einem flachen beschuppten Eindruck, an der Basis durch eine Querfurche abgesetzt, Stirn mit einer kurzen Mittellängsfurche und einem Schuppenfleck. Halsschild breiter wie lang, die Seiten kräftig gewölbt, auf der Scheibe abgeflacht, grob verworren zusammenlaufend punktiert mit einem etwas schwach punktierten Streifen auf der Scheibe in der Mitte. Am Vorderrand ein Schuppenstreifen welcher sich mit einem Längsstreifen auf den Seiten über den Vorderhüften verbindet, ein anderer gekrümmter Schuppenlängsstreifen je seitlich der Mitte. Diese Schuppenstreifen umschreiben eine grosse Kahlmakel auf den Seiten des Halsschildes und eine grössere auf der Scheibe. Flügeldecken oval, beim Weibchen der apikale Deckenabsturz an der Naht steiler als beim Männchen, die Naht etwas geschwollen hervortretend, greis behaart und in zwei kurzen stumpfen Spitzen endend; beim Männchen verrundet. Jede Decke mit neun glatten schwarzen Längsschwielen die gleichbreit sind wie die furchenartigen punktierten und dicht beschuppten längsstreifenartigen Zwischenräume. Unterseite schwarz, Mittelbrust in der Mitte dicht hell bräunlich behaart, besonders beim Männchen.

Männchen: Länge, 8.8 Millimeter (ohne Rüssel); Breite, 3.2. Weibchen: Länge, 9.8 Millimeter (ohne Rüssel); Breite, 4.

LUZON, Provinz Benguet, im Thale nach dem Igorotendorfe Atoc (W. Schultze). Typen in meiner Sammlung.

Metapocyrtus (Metapocyrtus) sumptuosus sp. nov. Tafel 1, Fig. 4, ♂.

Schwarz, Halsschild mit goldig beschuppter Querbinde, Flügeldecken mit schmalen goldigen Längsschuppenstreifen, die vor und hinter der Mitte durch zwei Kahlquerbinden unterbrochen sind. Rüssel in der Apikalhälfte dicht und gleichmässig punktiert sowie der Länge nach gewölbt, in der Mitte durch eine Querfurche abgesetzt. Eine unregelmässige Längsfurche bis zur Stirn reichend, welche goldig beschuppt ist. Stirn grob

zerstreut punktiert. Halsschild etwas breiter wie lang, sehr grob und zusammenlaufend punktiert, mit einer schmalen Schuppenbinde am Vorderrand und einer anderen Querbinde etwas hinter der Mitte; beide Binden laufen auf den Seiten in eine grosse Makel zusammen. Flügeldecken kurz oval, beim Weibchen in kurze, stumpfe, etwas nach oben gebogene Spitzen auslaufend. Die Decken reihenförmig unregelmässig grob punktiert, die Spatien sind im basalen sowie im apikalen Drittel leistenartig vortretend, die etwas furchenartigen Punktreihen goldig beschuppt. Etwas vor und etwas hinter der Mitte eine Querkahlbinde; beim Weibchen ist die vordere Kahlbinde im dorsalen Teil nach der Basis zu bedeutend erweitert. Unterseite und Beine spärlich weisslich behaart. Hinterschenkel des Männchens wie bei allen Arten dieser Gattung, die Deckenspitze überragend.

Männchen: Länge, 11.5 Millimeter (ohne Rüssel); Breite, 5. Weibchen: Länge, 12 Millimeter; Breite, 5.

LUZON, Provinz Ilocos Norte, Berg Palimlim (W. Schultze). Typen in meiner Sammlung.

Unter dem Material obiger Art vom selben Fundort befinden sich eine Anzahl Stücke die erheblich abweichen.

Metapocyrtus sumptuosus var. *aureatus* var. nov.

Halsschild, mit Ausnahme einer Kahlquerbinde vor der Mitte, zerstreut goldig beschuppt. Flügeldecken ohne Kahlquerbinden, die rippen- oder leistenartigen Spatien gleichmässig ausgeprägt, die furchenartigen Punktreihen gleichmässig goldig beschuppt, so das eine alternierende schwarz-goldige Längsstreifenzeichnung entsteht.

Metapocyrtus sumptuosus gehört in die Verwandtschaft von *M. virgatus* Heller, welche jedoch schlanker gebaut ist. Diese Art erhielt ich in Anzahl von der Insel Panay, Culasi (R. C. McGregor). Die Art ist beschrieben nach einem Männchen von der Insel Negros. Das Weibchen hat die Apikalenden der Decken ebenfalls, in jedoch ganz kurze gedrungene, stumpfe Spitzen auslaufend.

Metapocyrtus (*Metapocyrtus*) *interruptostriatus* sp. nov. Tafel 2, Fig. 4, ♂.

Schwarz, glänzend, Halsschild und Flügeldecken mit feinen blassgrünen Schuppenlängslinien; verwandt mit *M. pseudomoniifer* Heller und *interruptolineatus* Heller. Rüssel kräftig verworren punktiert, nach der Apex zu stark divergierend, die Seitenränder schwielig hervortretend, ein dreieckiger Eindruck

in der Basalhälfte, sowie eine Mittellängsfurche welche bis zur Stirn reicht. Letztere zerstreut punktiert und mit einem kleinen makelartigen Schuppenschwarm welcher durch die Furche geteilt wird. Halsschild so lang wie breit, mit scharf ausgeprägter Furche nächst dem Vorder- und Hinterrande, sowie mit Mittellängsfurche, welche jedoch vor der Hinterrandfurche endet. Ein schmaler Schuppenstreifen am Vorderrand und eine feine abgekürzte Längsschuppenlinie, je seitlich der Mitte, nächst dem Hinterrande, sowie ein kleiner bläulicher Schuppenschwarm auf den Seiten über den Vorderhöften. Flügeldecken fein zerstreut punktiert, beim Männchen an der Apex verrundet, beim Weibchen schwach tuberkelartig geschwollen, im basalen und apikalen Drittel mit abgekürzten blassgrünen Schuppenlinien welche furchenartig ausgeprägt sind. Diese rudimentären Schuppenlinien befinden sich an der Stelle der zweiten, vierten, und sechsten Punktreihe, die achte Schuppenlinie ist durchgehend erhalten und reicht bis zur Apex, um sich dort mit der zweiten rudimentären Schuppenlinie zu verbinden. Diese zweite Schuppenlinie ist im apikalen Drittel gegabelt indem eine kurze Fortsetzung der vierten Schuppenlinie mit ihr zusammenläuft. Die Schuppenlinien sind beim Weibchen stärker erhalten als beim Männchen. Unterseite; der mittlere Teil der Hinterbrust und des ersten Abdominalsegmentes nur beim Männchen kräftig quervergerunzelt und dicht bräunlich behaart.

Männchen: Länge, 12 Millimeter (ohne Rüssel); Breite, 5.3.

Weibchen: Länge, 10.5 Millimeter (ohne Rüssel); Breite, 4.8.

LUZON, Provinz Benguet, Berg Santo Tomas (W. Schultze). Typen in meiner Sammlung.

Bei den Männchen dieser und den oben angeführten Arten ist das Halsschild relativ bedeutend grösser als bei den Weibchen. *Metapocyrtus interruptolineatus* Heller sammelte ich in Luzon, Benguet, in der Nähe des Dorfes Atoc; *M. pseudomonilifer* Heller erwarb ich im Tausch, ohne genauen Fundort.

Homalocyrtus maculatus sp. nov. Tafel 1, Fig. 13, ♂.

Dunkelbraun, Flügeldecken mit goldigen Schuppenmakeln, am nächsten verwandt mit *H. tumidosus* Heller. Rüssel in der Mitte mit einer scharf ausgeprägten Querfurche, die apikale Hälfte sehr dicht zusammenlaufend punktiert und nach vorn zu stärker divergierend als bei obiger Art. Die Basalhälfte mit einer scharf ausgeprägten Mittellängsfurche; Stirn mit wenigen zerstreuten goldigen Schuppen. Halsschild länger wie breit, gleichmässig perlig gekörnelt mit einer undeutlichen Mittelfurche. In der Mitte je seitlich eine kleine Schuppenmakel und auf den

Seiten über den Vorderhüften ein grösserer Schuppenschwamm, sowie ein schmaler Schuppenstreifen am Vorderrand. Flügeldecken gleichmässig dicht und zusammenlaufend gereiht-punktiert; die Skulptur ist glatter als bei *H. tumidosus* Heller. An der Basis ein grösserer makelartiger Schuppenschwamm welcher sich längs dem Seitenrande bis zum apikalen Drittel der Decken fortsetzt und dort in einige unregelmässige Makeln aufgelöst ist. In der Mitte jeder Decke drei eine Querreihe bildende Makeln. An der Naht, im apikalen Drittel (Männchen), eine makelartig beschuppte und fein beborstete schwache Schwellung.

Männchen: Länge, 11 Millimeter; Breite, 5.5.

Panaon (*G. Boettcher*). Leyte, aus den Bergen in der Nähe vom Dorfe Cabalian, im Süden der Insel erhielt ich eine grosse Anzahl von Exemplaren. Typus in meiner Sammlung.

CELEUTHETINÆ

Neopyrgops panayensis sp. nov. Tafel 1, Fig. 11.

Schwarz; Halsschild und Flügeldecken mit hellblauen Schuppenmakeln. In Körperform gedrungener gebaut wie *N. banksi* Heller, sowie die schwarze Beborstung viel dichter und länger. Rüssel auf der Dorsalseite kräftig der Länge nach gewölbt, grob verworren punktiert, mit zwei äusserst stark entwickelten Längsleisten, zwischen welchen sich eine breite Längsfurche befindet. Der aufgetriebene Teil des Rüssels vor der Stirn durch eine bogenförmige Furche scharf abgesetzt. Seiten des Rüssels mit einem Schuppenfleck. Fühler hellblau beschuppt und kurz schwarz beborstet. Halsschild länger wie breit, sehr grob und zusammenlaufend punktiert, die Zwischenräume gekörnt hervortretend, besonders auf den Seiten. Ein kleiner dreieckiger Schuppenfleck je seitlich der Mitte am Vorder- sowie am Hinterrande und eine grosse Schuppenmakel auf den Seiten über den Vorderhüften. Flügeldecken sehr kurz gedrunken oval, ungefähr ein Sechstel länger wie breit; grob gereiht-punktiert. Die ziemlich hervortretenden leistenartigen Zwischenräume raspelartig gekörnt und beborstet. Jede Decke, an der Basis mit einer länglichen Nahtmakel und einer anderen am Seitenrand. Etwas vor der Mitte, und nach den Seiten zu schräg nach vorn gerichtet, eine Querreihe von drei bis vier Schuppenmakeln. Im letzten Drittel eine weitere Querreihe von drei bis vier Makeln welche nach dem Seitenrande zu mehr oder weniger zusammenlaufen und sich mit einem Seitenrandstreifen verbinden, welcher bis zur Apex reicht und dort wiederum mit

einem kurzen Nahtstreifen zusammenfliesst. Unterseite, Mittel- und Hinterbrust, sowie erstes Abdominalsegment seitlich beschuppt, im Uebrigen raspelkörnig punktiert und fein beborstet. Schenkel mit einer breiten Binde nächst der Wurzel und vor der Spitze; Schienen und Tarsen mehr oder weniger hellblau beschuppt und fein beborstet.

Männchen: Länge, 11 Millimeter (ohne Rüssel); Breite, 5.8. Weibchen: Länge, 12.5 Millimeter (ohne Rüssel); Breite, 6.3.

PANAY, Jamindan (W. Schultze). Typen in meiner Sammlung.

Die hellblaue Färbung der Schuppen in dieser Art ist bei älteren Exemplaren meist hell blassgrün.

ALCIDINÆ

Alcides (*Metallalcides*) *butuanensis* sp. nov. Tafel 2, Fig. 10.

Kopf, Flügeldecken, und Beine kupferig glänzend pechbraun, Halsschild grünlich glänzend. Halsschild und Flügeldecken mit blassgelben Tomentmakeln, die Tomentierung der Makeln ist dicht und lang. Rüssel dicht und verworren punktiert auf dem Rücken mit einer glatten Schwiele. Kopf dicht und fein punktiert, mit einem tiefen Eindruck auf der Stirn. Halsschild raspelartig zerstreut punktiert mit einer glatten Mittellängslinie. Je seitlich am Vorderrand eine schmale Quermakel, eine andere grössere je seitlich am Hinterrand und eine kleine runde Makel in der Mitte über dem Schildchen. Flügeldecken regelmässig tief gereiht-punktiert. Jede Decke mit fünf Tomentmakeln, eine grosse runde Makel an der Basis von der ersten bis zur vierten Punktreihe reichend, eine grosse Quermakel in der Mitte, und eine kleine Makel am Seitenrand sowie zwei Makeln im apikalen Drittel, von welchen eine länglich keilförmige sich zwischen der ersten und dritten Punktreihe befindet. Unterseite der Vorderbrust tomentiert, Mittelbrust je seitlich mit einer Tomentmakel, Hinterbrust querbandartig tomentiert, jedoch in der Mitte unterbrochen. Abdominalsegmente lederartig gerunzelt, zweites bis viertes Segment nach den Seiten zu stärker, in der Mitte schwächer tomentiert. Beim Weibchen ist die Grundfärbung blauschwarz, nur das Halsschild grünlich glänzend.

Männchen: Länge, 8 Millimeter; Breite, 3.5. Weibchen: Länge, 10 Millimeter; Breite, 4.3.

MINDANAO, Provinz Agusan, Butuan (C. F. Baker). Typen in meiner Sammlung; Cotypen No. 16996 in der Sammlung von Prof. C. F. Baker.

Alcides (Metallalcides) gubatanus¹² sp. nov.

Dunkelblau glänzend, Halsschild und Flügeldecken mit kremfarbigen Tomentmakeln. In Körperform und Grösse *A. butuanensis* Schultze sehr ähnlich. Rüsselseiten nach der Basis zu dicht und grob zerstreut punktiert, Stirn mit einer punktförmigen Impression. Kopf fein und dicht punktiert. Halsschild zerstreut raspelkörnig punktiert, im vorderen Teil seitlich eingeschnürt. Je seitlich der Mitte nächst dem Vorderrande mit einer kleinen queren Tomentmakel, einer anderen, dreieckigen, mit der Spitze nach dem Schildchen gerichteten, Tomentmakel in der Mitte am Hinterrand, und eine grössere Quermakel auf den Seiten am Hinterrand. Flügeldecken, die grösste Breite zwischen den Schulterbeulen; mit regelmässigen kräftig ausgeprägten Punktreihen, die Punkte länglich. Jede Decke mit drei Tomentmakeln; zwei bilden eine Querreihe in der Mitte, von welchen die an der Naht gelegene kleiner und mehr rundlich ist; und eine grosse breit hakenförmige Makel im apikalen Viertel. Unterseite der Vorderbrust mit einem Quertomentstreifen nächst dem Vorderrande, Mittel- und Hinterbrust mit einer Tomentmakel je seitlich. Zweites bis viertes Abdominalsternit nahezu ganz kremweiss tomentiert. Analsternit äusserst dicht narbig punktiert.

Länge, 9.3 Millimeter (ohne Rüssel); Schulterbreite, 4.

MINDORO, Pinamalayan (*A. Duyag*). Typus in meiner Sammlung.

Alcides (Metallalcides) mangyanicus¹³ sp. nov.

Rüssel, Kopf, und Beine dunkel blau, glänzend; Halsschild und Flügeldecken einfarbig dunkel bläulich grün, metallisch glänzend. In Körperform und Grösse dem *A. semperi* Pascoe sehr ähnlich. Rüssel fein zerstreut punktiert, Stirn mit einem kleinen dreieckigen Eindruck. Antenna schwarz mit Ausnahme der grau pubeszierten Keulenglieder. Halsschild, seitlich nächst dem Vorderrande kräftig eingeschnürt; sehr grob und tief und ziemlich dicht zerstreut punktiert, nächst dem Vorderrande ist die Punktierung feiner, nach den Seiten zu dichter und gröber, teilweise zusammenlaufend. Flügeldecken, die grösste Breite zwischen den Schulterbeulen; mit nicht sehr kräftigen, aber regelmässigen Punktreihen, die Zwischenräume

¹² "Gubat" bedeutet dichter wilder Gebirgswald in der Mangyanes und Tagaler Sprache.

¹³ Die Mangyanes, ein nur auf die Insel Mindoro beschränkter Philippiner Volkstamm.

fein zerstreut punktiert und fein chagriniert. Unterseite der Mittelbrust fein und dicht graubraun pubesziert, jedoch in der Mitte, nach dem Hinterrande zu in dreieckiger Form kahl, fein punktiert und quer gerunzelt. Erstes Abdominalsternit seitlich ebenfalls fein pubesziert.

Länge, 14.5 Millimeter (ohne Rüssel); Schulterbreite, 6.5.

MINDORO, Pinamalayan (*M. Ramos*). Typus in meiner Sammlung.

CALANDRINÆ

Eugithopus uhlemanni sp. nov. Tafel 1, Fig. 1 und 2.

Kremweiss; Halsschild und Flügeldecken mit schwarzen Längsstreifen und Makeln. Rüssel stark gebogen, auf dem Rücken mit einer nach der Stirn zu divergierenden schwarzen Längsschwiele, Rüsselseiten mit einer schmälere Längsschwiele welche an der Fühlergrube endet. Stirn mit einem tiefen länglichen Grübchen. Unterseite und apikaler Teil des Rüssels ebenfalls schwarz. Fühler, zweites Geisselglied am längsten. Das schwarze becherförmige Endglied an der Spitze weiss. Halsschild in der Mitte mit einem breiten schwarzen Längsstreifen und je seitlich ein schmälere Streifen vom Vorder- bis zum Hinterrand reichend. Seiten mit einer länglichen schwarzen Makel. Die kremweissen Flächen weitläufig zerstreut punktiert, die schwarzen Flächen dichter punktiert. Flügeldecken je mit neun scharf eingerissenen, feinen Längsfurchen. Zwischen der ersten und dritten Furche, ein an der Basis und Apex verkürzter, schwarzer Längsstreifen. Nächste der Basis eine schwarze Makel zwischen der dritten und sechsten Furche. Ein weiterer Längsstreifen, welcher in der Mitte und nächste der Apex makelartig erweitert ist, zwischen der fünften und neunten Furche. Pygidium grob zerstreut punktiert, mit einer schwarzen Makel in der Mitte und einer kurz beborsteten Mittellängsschwiele. Unterseite der Vorder-, Mittel-, und Hinterbrust weitläufig zerstreut punktiert, ebenfalls die Abdominalsegmente, nur das Letzte sehr grob punktiert. Schenkel narbig punktiert, Schienen an der Unterseite kurz beborstet. Die Apikalhälfte des Klauengliedes schwarz.

Länge, 24.5 Millimeter (ohne Rüssel); Breite, 9.

MINDANAO, Provinz Surigao, Surigao (*W. Schultze*). Typus in meiner Sammlung.

Von den anderen philippinischen Arten dieser Gattung (*E. elegans* Roelofs, *ochreatus* Eydox et Souleyet, *ornatus* und *plagiatus* Roelofs) unterscheidet sich diese Art schon durch

die Grösse, sowie durch die kremweisse und schwarze Zeichnung. Diese schöne Art widme ich dem Andenken von Herrn R. Uhlemann, dem früheren Vorsitzenden des Leipziger Entomologischen Vereins "Iris," Leipzig.

UNTERSUCHUNGEN ÜBER DIE PENISFORMEN VON PACHYRRHYNCHINEN (CURCULIONIDÆ)

Zu den vergleichenden Untersuchungen über die Penisstruktur von Pachyrrhynchinen, konnte ich 27 Arten der Gattung *Pachyrrhynchus*; 3 Arten von *Metapocyrtus*; 1 ausser-philippinische Gattung und Art *Pantorhytes*; 3 Arten von *Homalocyrtus*; und 2 Arten von *Macrocyrtus* heranziehen.

In Bezug auf die Präparation des in Betracht kommenden Organs möchte ich erwähnen, da ja alle Arten dieser Käfergruppe äusserst hart sind, dass ich in folgender Weise vorging. Mittels einer feinen, dreikantig spitz angeschliffenen Seziernadel bohrte ich in der Kerbung zwischen dem ersten und zweiten Abdominalsternit an zwei oder drei Stellen ein, drückte die Sternite, welche in einem Stück zusammenhängen, leicht ein und hob dieselben dann heraus. Mittels einer feinen gebogenen Pincette kann man dann den Penis fassen und herausziehen. Darauf weichte ich dieses Organ mit den in getrockneten Käfern dasselbe fest umgebenden Häuten in Wasser, und löste dieselben mit der Nadel leicht ab, da es mir bei den Untersuchungen nur auf Vergleiche der allgemeinen Penisformen an sich ankam, um dieselben eventuell als Hilfsmittel in der Bestimmung zu benutzen, sowie zur Feststellung des verwandtschaftlichen Verhältnisses von Gattungen und Arten unter sich. Der Penis dieser Curculioniden ist ein hartes, langes, röhrenförmiges, in der Seitenansicht meist gebogenes, stark chitiniertes Organ, in der Färbung, je nach der Art, hell transparent bräunlich bis dunkelkastanienbraun oder nahezu schwarz. Wie ich feststellen konnte zeigt der Penis der verschiedenen Arten, in den äusserlichen Formen, besonders in Bezug auf Länge, Form der Spitze, Krümmung, und Form des Mündungshofes; der Austrittsstelle des Ductus ejaculatorius; zum Teil sehr scharf ausgeprägte Artmerkmale. Als Oberseite, natürlich die den Decken zugekehrte Seite, bezeichne ich in allen Abbildungen die Seite des Mündungshofes. Die Seitenansicht aller Figuren (rechts) hat die Mündungshofseite der Oberseitenfigur zugekehrt.

Die Form des Penis ist (siehe Seitenansichten) in seinen Krümmungen an die Form und Wölbung des Abdomens und Flügeldecken besonders der apikalen Termination des letzteren

angepasst, ebenfalls unter gewisser Anpassung an die Form der Flügeldecken des Weibchens, welche in den meisten Arten mehr oder weniger von der des Männchens verschieden ist.

Zum Beispiel, alle *Pachyrrhynchus*-Arten haben kräftig gewölbte Flügeldecken, die Penisformen sind demgemäss alle gekrümmt, im Gegensatz zu den Arten der Gattung *Macrocyrtus* welche mehr abgeflachte Flügeldecken besitzen bei denen die Penisform (Tafel 4, Fig. 18 und 19), langgestreckt und kaum gekrümmt ist. Gewisse Arten die äusserlich grosse Aehnlichkeit haben, zum Beispiel *Pachyrrhynchus apicatus* (Tafel 3, Fig. 1) und *venustus* (Tafel 3, Fig. 2) oder *P. pinorum*, *dubiosus*, *tristis* (Tafel 3, Fig. 3, 4, 5) oder *P. monilifer*, *orbifer*, *rugicollis* (Tafel 3, Fig. 16, 17, 18) oder *P. igorota*, *gloriosus*, *inclytus*, *pulchellus* (Tafel 4, Fig. 1, 2, 3, 4) zeigen auch in den Penisformen grosse Aehnlichkeit und bestätigen das verwandtschaftliche Verhältniss. Wiederum andere, äusserlich ähnliche Arten, zum Beispiel, *P. venustus* und *virgatus* (Tafel 3, Fig. 2 und 7), oder *P. decussatus*, *phaleratus*, *halconensis* (Tafel 3, Fig. 12, 13, 14) zeigen in den Penisformen wesentliche Unterschiede.

Noch andere Arten, die auch äusserlich in Bezug auf Form, Skulptur, und Zeichnung isoliert stehen, zeigen auch in der Form des obigen Organs besondere Abweichungen, zum Beispiel, *P. ochroplagiatus*, *sumptuosus*, *argus* (Tafel 3, Fig. 6, 11, 15) von den anderen Arten. Auf Grund des allerdings lückenhaften Materials, scheint die ausserphilippinische Gattung *Pantorhytes* (Tafel 4, Fig. 11) der Gattung *Pachyrrhynchus* (Tafel 3, Fig. 1 bis 20, Tafel 4, Fig. 1 bis 7) am Nächsten zu stehen. Dieser Letzteren sehr nahe verwandt ist auch die Gattung *Metapocyrtus* (Tafel 4, Fig. 8, 9, 10), jedoch mit Ausnahme der Subgattung *Homalocyrtus*.¹⁴ Arten der Letzteren sind äusserlich auch in der Bauart verschieden, besonders aber im männlichen Geschlecht sind die Flügeldecken im dorsalen Teil mehr abgeflacht und bis zum zweiten Drittel ihrer Länge stark divergierend, verbreitert, dagegen beim weiblichen Geschlecht gleichmässiger gewölbt und schlanker gebaut. Aus diesem Grunde, besonders aber durch die eigentümliche Penisform, die sich ganz bedeutend von allen anderen untersuchten Gattungen unterscheidet, ist *Homalocyrtus* als selbstständige Gattung anzuerkennen. Da auch die Artbestimmung innerhalb dieser Gattung eine ziemlich

¹⁴ An dieser Stelle möchte ich einen Fehler korrigieren der gemacht wurde, ehe ich die Penisuntersuchungen vornahm; die breiten Stücke von *Homalocyrtus*-Arten sah ich als die Weibchen an, jedoch sind dieselben Männchen, vergl. Philip. Journ. Sci. 15 (1919) 554.

schwierige ist, so sind doch an den Penisformen von *H. conicus*, *intermittens*, *maculatus* (Tafel 4, Fig. 15, 16, 17) ausgeprägte Artunterschiede zu erkennen. Besonders merkwürdig sind auch die hakenförmigen, mit der Oberseite nach oben gekrümmten Penisformen der Gattungen *Pseudapocyrtus* und *Apocyrtus*, als Beispiele, *P. catanduanensis* und *formicarius* (Tafel 4, Fig. 12 und 13) sowie *A. inflatus* (Tafel 4, Fig. 14). Weit verschieden von den *Pachyrrhynchus* Penisformen sind auch die an der Spitze schräg abgestutzten federkielartigen Formen von *Macrocyrtus erosus* und *subcostatus* (Tafel 4, Fig. 18 und 19). Jedenfalls zeigen diese Untersuchungen deutlich wie ratsam es ist, diese Organe, besonders bei der Aufstellung von neuen Gattungen, in Berücksichtigung zu ziehen.

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ILLUSTRATIONEN

[Zeichnungen von W. Schultze.]

TAFEL 1

- FIG. 1. *Eugithopus uhlemanni* sp. nov., natürliche Grösse.
 2. *Eugithopus uhlemanni* sp. nov., Seitenansicht des Kopfes, vergrössert.
 3. *Acronia* ? *alboplagiata* sp. nov., natürliche Grösse.
 4. *Metapocyrtus* (*Metapocyrtus*) *sumptuosus* sp. nov. ♂, $\times 2$.
 5. *Euclea gloriosa* sp. nov., ♀ natürliche Grösse.
 6. *Doliops multifasciata* sp. nov., $\times 2$.
 7. *Pseudapocyrtus apicatus* sp. nov., ♀, $\times 2$.
 8. *Aphrodisium palawanum* sp. nov., ♀ natürliche Grösse.
 9. *Metapocyrtus* (*Metapocyrtus*) *atocanus* sp. nov., ♂ $\times 2$.
 10. *Metapocyrtus* (*Artapocyrtus*) *octomaculatus* sp. nov., ♂, $\times 2$.
 11. *Neopyrgops panayensis* sp. nov., $\times 2$.
 12. *Metapocyrtus* (*Metapocyrtus*) *lindabonus* sp. nov., ♂, $\times 2$.
 13. *Homalocyrtus maculatus* sp. nov., ♂, $\times 2$.

TAFEL 2

- FIG. 1. *Pachyrrhynchus sulphureomaculatus* sp. nov., ♀, $\times 2$.
 2. *Pachyrrhynchus pseudoproteus* sp. nov., ♂, $\times 2$.
 3. *Pachyrrhynchus halconensis* sp. nov., ♀, $\times 2$.
 4. *Metapocyrtus* (*Metapocyrtus*) *interoptostriatus* sp. nov., ♂, $\times 2$.
 5. *Pachyrrhynchus consobrinus* sp. nov., ♂, $\times 2$.
 6. *Pachyrrhynchus regius* sp. nov., ♀, $\times 2$.
 7. *Pseudapocyrtus catanduanensis* sp. nov., ♀, $\times 2$.
 8. *Pachyrrhynchus orbifer* Waterhouse subsp. *azureus* subsp. nov., ♂, $\times 2$.
 9. *Pachyrrhynchus semignitus* sp. nov., ♂, $\times 2$.
 10. *Alcides* (*Metallalcides*) *butuanensis* sp. nov., $\times 2$.

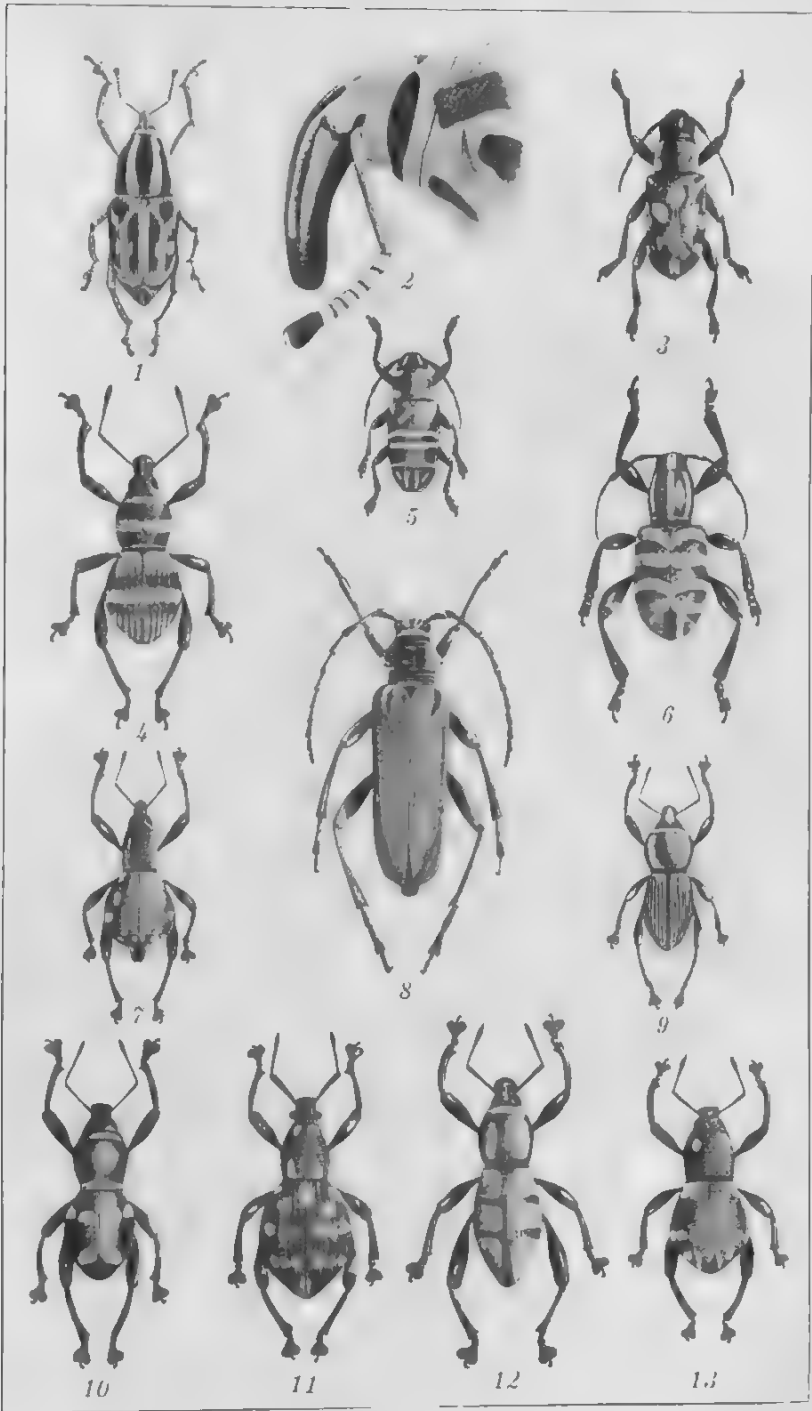
TAFEL 3

- FIG. 1. *Pachyrrhynchus apicatus* sp. nov.
 2. *Pachyrrhynchus venustus* Waterhouse.
 3. *Pachyrrhynchus pinorum* Pascoe.
 4. *Pachyrrhynchus dubiosus* Schultze.
 5. *Pachyrrhynchus tristis* Heller.
 6. *Pachyrrhynchus ochroplagiatus* Heller.
 7. *Pachyrrhynchus virgatus* Schultze.
 8. *Pachyrrhynchus congestus* Pascoe.
 9. *Pachyrrhynchus coerulans* Kraatz.
 10. *Pachyrrhynchus immarginatus* Kraatz (= *sanchezi* Heller).
 11. *Pachyrrhynchus sumptuosus* Schultze.

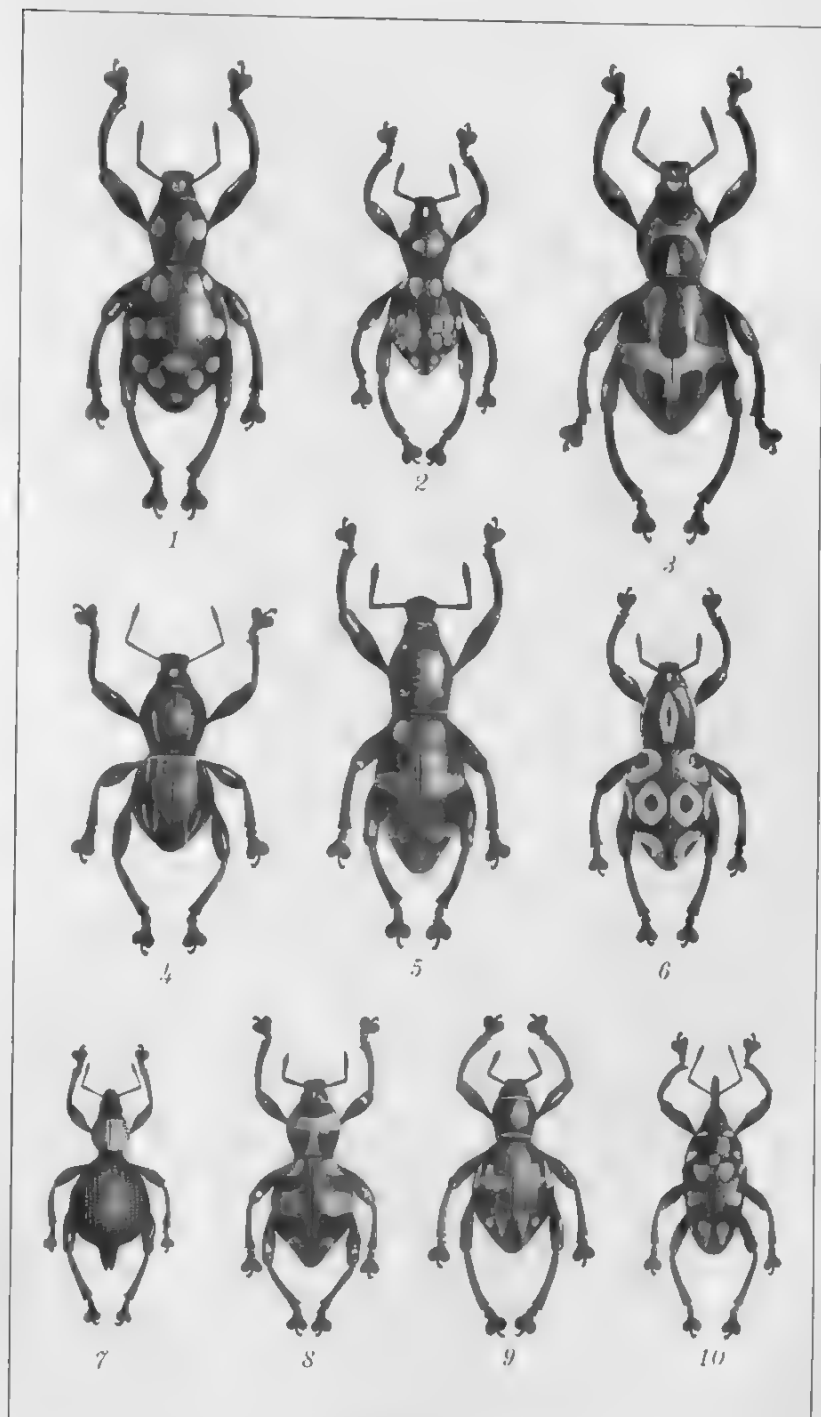
12. *Pachyrrhynchus decussatus* Waterhouse.
13. *Pachyrrhynchus phaleratus* Waterhouse.
14. *Pachyrrhynchus halconensis* sp. nov.
15. *Pachyrrhynchus argus* Pascoe.
16. *Pachyrrhynchus monilifer* Germar.
17. *Pachyrrhynchus orbifer* Waterhouse.
18. *Pachyrrhynchus rugicollis* Waterhouse.
19. *Pachyrrhynchus circulatus* Heller.
20. *Pachyrrhynchus reticulatus* Waterhouse.

TAFEL 4

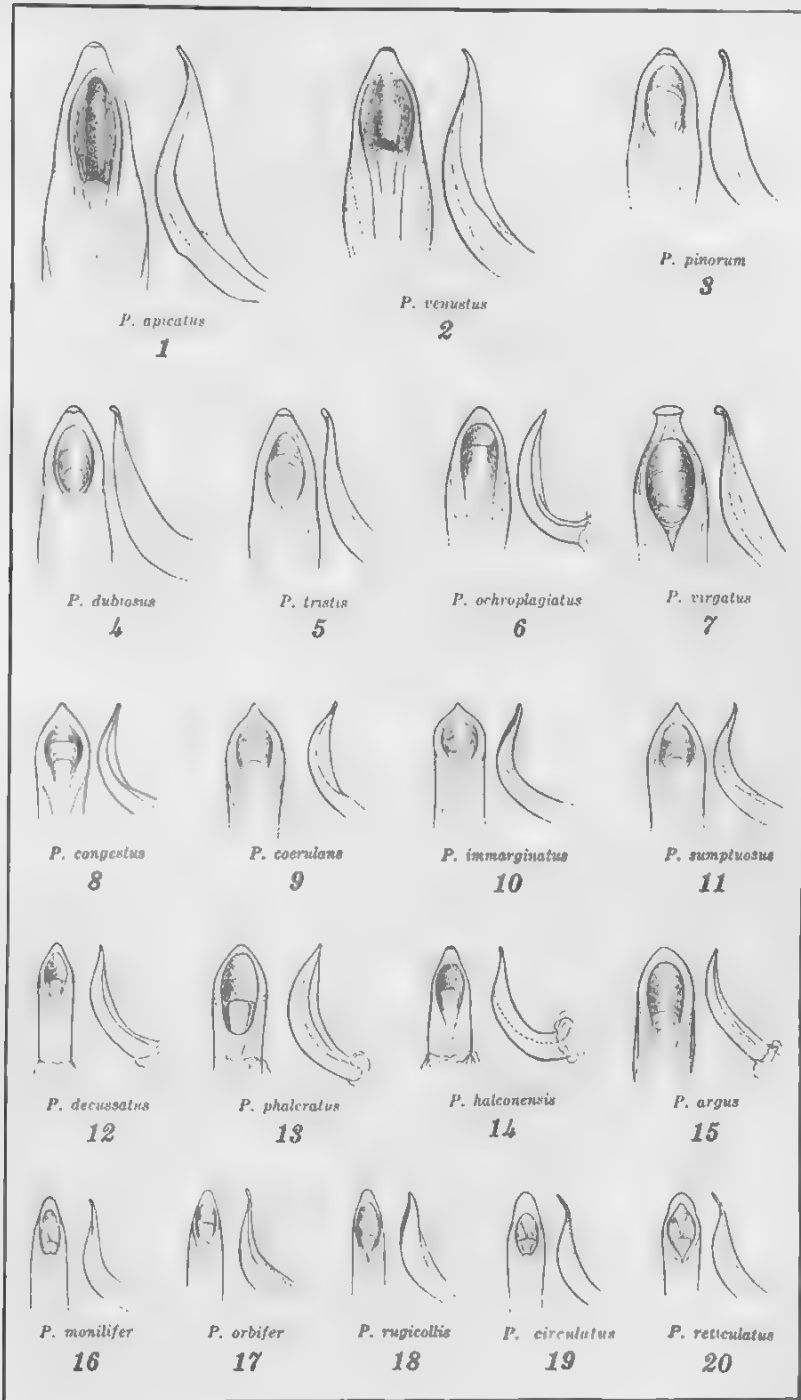
- FIG. 1. *Pachyrrhynchus igorota* Schultze.
2. *Pachyrrhynchus gloriosus* Faust.
3. *Pachyrrhynchus inclytus* Pascoe (= *modestior* Behrens).
4. *Pachyrrhynchus pulchellus* Behrens.
5. *Pachyrrhynchus erosus* Schultze.
6. *Pachyrrhynchus anellifer* Heller.
7. *Pachyrrhynchus erichsoni* Waterhouse.
8. *Metapocyrtus* (*Orthocyrtus*) *insularis* Schultze.
9. *Metapocyrtus* (*Orthocyrtus*) *pachyrrhynchoides* Heller.
10. *Metapocyrtus* (*Artapocyrtus*) *sexmaculatus* Schultze.
11. *Pantorhytes plutus* Oberthür.
12. *Pseudapocyrtus catanduanensis* sp. nov.
13. *Pseudapocyrtus formicarius* Heller.
14. *Apocyrtus inflatus* Erichson.
15. *Homalocyrtus conicus* Boheman.
16. *Homalocyrtus intermittens* Heller.
17. *Homalocyrtus maculatus* sp. nov.
18. *Macrocyrtus erosus* Pascoe.
19. *Macrocyrtus subcostatus* Heller.



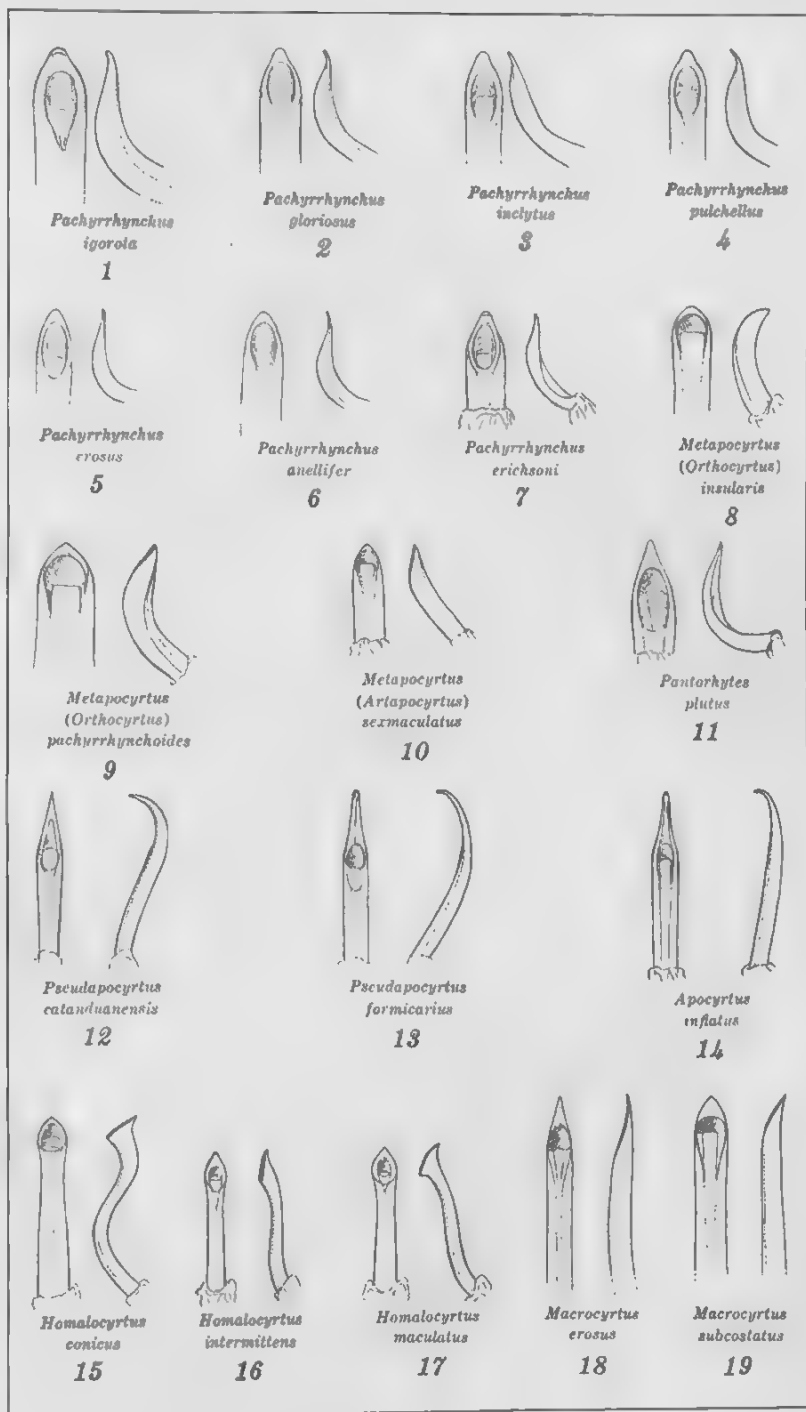
TAFEL 1.



TAFEL 2.



TAFEL 3. PENISFORMEN VON VERSCHIEDENEN PACHYRRHYNCHUS-ARTEN.



TAFEL 4. PENISFORMEN VON PACHYRRHYNCHINEN.

ERRATA

Volume 20, page 276, the generic name in the side heads should read *Poeciloterpa*. Cancel the second correction on page 671.

Volume 21, page 162, *for* line 8 *read* April 23 to May 1. Balbalian. Rains began four days after my arrival,

INDEX

[New generic and specific names and new combinations are printed in clarendon; synonyms and names of species incidentally mentioned in the text are printed in *italic*.]

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